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ABSTRACT

This seminar was organized to: (1) study the place and need of environmental education (EE) in the context of technical and vocational education; (2) develop strategies for the incorporation of EE into the curriculum and teacher-training for pre-university industrial schools; (3) develop prototype EE materials for incorporation into the curriculum and teacher-training for industrial schools; (4) enhance exchange of information and experience through the preparation and presentation of country reports on the development of EE in the context of technical and vocational education among participating member states; and (5) identify documents and activities to be developed at sub-regional, regional and international levels on the incorporation of EE into technical and vocational education. Presented in this document are the proceedings of the seminar, a background presentation, country reports, working documents, seminar materials, a list of suggested activities, and follow-up documents. The appendices list the seminar timetable, speeches, documents, participants, organizing committee, report of a slide presentation and field trip, and resumes of working documents and country reports. (CW)

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SUBREGIONAL TRAINING SEMINAR ON THE INCORPORATION OF ENVIRONMENTAL EDUCATION INTO INDUSTRIAL EDUCATION FOR THE CARIBBEAN

ORGANISED BY
COLLEGE OF ARTS, SCIENCE AND TECHNOLOGY

IN COOPERATION WITH
UNESCO - UNEP INTERNATIONAL ENVIRONMENTAL EDUCATION PROGRAMME

9 - 16 MAY 1988, KINGSTON, JAMAICA

U.S. DEPARTMENT OF EDUCATION
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FINAL REPORT

SE 050 779

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Subregional Training Seminar on the Incorporation of Environmental Education Into Industrial Education For the Caribbean

organised by the
College of Arts, Science and Technology

in cooperation with

Unesco - UNEP International Environmental Education Programme

9-16 May, 1988
Kingston, Jamaica

Final Report

College of Arts, Science and Technology

December 1988

Opinions and views expressed in this final report are those of the participant of the Subregional Training Seminar on the Incorporation of Environmental Education into Industrial Education for Caribbean and do not necessarily reflect the official position of UNESCO or CAST.

Published by the Science Department, College of Arts, Science & Technology, and Printed at CAST Printery, 237 Old Hope Rd, Kingston 6, Jamaica (W.I).

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1. INTRODUCTION

1.1 Background of the Seminar

The College of Arts, Science and Technology (CAST), Kingston, Jamaica, in collaboration with the UNESCO - UNEP International Enviromental Education Programme (IEEP) organized a Sub-Regional Training Seminar on the Incorporation of Environmental Education into Industrial Education for the Caribbean. The Seminar was conceived within the context of UNESCO's programme and budget for 1986-87 and as an activity of IEEP, Division of Science, Technical and Environmental Education for the incorporation of Environmental Education into the curriculum of industrial schools.

Directives regarding the following were issued by UNESCO:

- Objectives
- Agenda
- Information Note
- Timetable of work
- Draft invitation letter
- Working documents
- List of Member-States to be invited
- Reference documents.

Financial contribution towards costs incurred in the coordination of this seminar was provided by UNESCO. In the areas of technical support and organizational assistance, Dr. Abdul Ghafoor Ghaznawi, Programme Specialist in Environmental Education, UNESCO, Paris, proved to be of inestimable worth.

CAST over the years, through its Science and Building departments has displayed both peripheral and primary interest in the area of environmental education. This coupled with the College's leadership role as a regional (Caribbean) tertiary level educational institution influenced the choice of the College as the host institution for the organization and delivery of the seminar.

The Science Department under the leadership of Mr. George Roper, Seminar Coordinator, was assigned the task of organising the seminar on behalf of the College. The Science Department has for a number of years been involved with environmental education both at the national institutional level and together with the Building, Engineering and Technical Teacher Training departments have provided both national and regional leadership in the areas of technical/vocational and industrial education.

1.2 Objectives of the Seminar

The aim of the Seminar was to provide training of participants from Member States within the sub-region and was organised in keeping with the following objectives:

i) To study the place and need of Environmental Education (EE) in the context of Technical and Vocational Education (TVE);

ii) To develop strategies for the incorporation of EE into the curriculum and teacher-training for pre-university industrial schools;

iii) To develop prototype EE materials for incorporation into the curriculum and teacher-training for industrial schools;

iv) To enhance exchange of information and experience through the preparation and presentation of country reports on the development of EE in the context of technical and vocational education among participating Member States.

v) To identify documents and activities to be developed by IEEP at sub-regional, regional and international levels on the incorporation of EE into Technical and Vocational Education.

1.3 Agenda

i) Opening of the Seminar.

ii) Presentation on UNESCO - UNEP International Environmental Education Programme by UNESCO Representative.

iii) Presentation of Country Reports.

iv) The Place and need of EE in TVE.

v) Review of strategies for the incorporation of EE in the curriculum and teacher-training for industrial schools.

vi) Presentation of Case Studies on the Incorporation of EE into Industrial Education:

- Singapore
- Czechoslovakia
- Jamaica

vii) Development of prototype EE materials for industrial schools.

viii) Suggested documents and activities on the incorporation of EE into industrial education to be developed by IEEP at sub-regional, regional and international levels.

ix) Educational field trip.

x) Study of draft final report.

xi) Closing of the Seminar.

1.4 **Working Documents**

Seminar working sessions were enhanced by utilisation of the following documents:

a) Environmental Education in Technical and Vocational Education, UNESCO (E#24).

b) Strategies for the Incorporation of Environmental Education into Curriculum and Teacher Training for Industrial Schools. UNESCO.

c) Case Study on the Incorporation of Environmental Education (EE) into Curriculum and Teacher Training of Technical Schools in Singapore - UNESCO.

d) Case Study on the Incorporation of Environmental Education into Curriculum and Teacher Training of Technical Schools in Czechoslovakia - UNESCO.

e) Case study on the Incorporation of Environmental Education into Curriculum and Teacher Training of Technical Schools in Jamaica - UNESCO.

1.5 **Participants and Observers**

Sub-regional invitees to the seminar came from the following countries: Antigua, Barbados, Cuba, Dominica, Grenada, Guyana, Jamaica, St. Lucia, St. Vincent and the Grenadines.

Additionally, several TVE experts from CAST and other Government-affiliated institutions were invited as observers with a view to the gleaning of gainful information through their participation in the plenary sessions. The list of 18 participants and observers is given in Appendix A.4.

1.6 **Time-table of Work**

Time-table of work is given in Appendix A.1

1.7 **Date and Venue**

The Seminar was convened from May 9 to May 16, 1988 in the premises of the College of Arts, Science and Technology, 237 Old Hope Road, Kingston 6, Jamaica, W.I.

1.8 **Bureau of Seminar**

The Seminar Bureau was comprised of the following individuals:

Chairman	-	Mr. Roger Marville	(Barbados)
Vice-Chairman	-	Mr. Eustace Hill	(Antigua)
Rapporteur	-	Ms. Elizabeth Henry	(Grenada)

1.9 **Steering Committee:**

Chairman	-	Dr. Alfred W. Sangster	- President, CAST
Advisor	-	Dr. Abdul Ghafoor Ghaznawi	(UNESCO, Paris)
Members	-	Mr. George A. Roper	- CAST
	-	Mr. Yogen K. Saxena	- CAST
	-	Mr. Milton Pinnock	- UWI
	-	Mr. Roger Marville	- Barbados
	-	Mr. Eustace Hill	- Antigua
	-	Ms. Elizabeth Henry	- Grenada
	-	Ms. Sharon Hay-Webster	- CAST
	-	Ms. Janet Bedasse	- CAST

1.10 **Drafting Committee**

Chairman	- Mr. George A. Roper
Members	- Dr. Joyce Glasgow
	- Mr. Milton A. Pinnock
	- Mr. Yogen K. Saxena
	- Ms. Elizabeth Henry
	- Mr. Giles Romulus
	- Mr. Roger Marville
	- Ms. Sharon Hay-Webster
	- Ms. Janet Bedasse
	- Dr. Abdul Ghafoor Ghaznawi

1.11 **UNESCO Secretariat**

Dr. Abdul Ghafoor Ghaznawi, Programme Specialist; Environmental Education, Division of Science, Technical and Environmental Education, UNESCO, Paris.

1.12 **Resource Persons**

CAST provided the following resource persons:

1. Dr. Joyce Glasgow, Senior Lecturer, Teacher Education Development Department, University of West Indies.

2. Dr. Kris Murthy, UNESCO-Project Co-ordinator, Engineering Dept., College of Arts, Science & Technology.

3. Ms. Vilma McClenan, Director, Science, Technology & Research Department, Ministry of Agriculture.

4 Mr. Andreas Oberli, Environmentalist, Former Curator, Cinchona Gardens, Jamaica.

5. Mr. Milton A. Pinnock, Lecturer, Department of Social & Preventive Medicine, University of the West Indies.

6. Mr. George A. Roper, Head, Department of Science, College of Arts, Science & Technology.

7. Dr. Alfred Sangster, President, College of Arts, Science & Technology.

8. Mr. Yogen Saxena, UNV-Environmental Engineer, College of Arts, Science & Technology.

9. Mr. Desmond Telfer, Lecturer, Technical Education Department, College of Arts, Science & Technology.

10. Mrs. Audrey Thomas, Lecturer, Building Department, College of Arts, Science & Technology.

1.13 **Working Groups**

	Group I	**Group II**
Chairman	Mr. Giles Romulus	Mr. Roger Marville
Rapporteur	Mr. Eustace Hill	Mr. John Cummings
Members	Mr. Kent Dennie	Dr. Joyce Glasgow
	Mr. Rolando Martinez	Ms. Elizabeth Henry
	Ms. Vilma McClennon	Dr. Kris Murthy
	Mr. Milton Pinnock	Mr. Andreas Oberli
	Mrs. Audrey Thomas	Mr. Yogen Saxena
	Mr. Franklyn Zamore	Mr. Desmond Telfer
		Mr. Vernal Thompson

2. PROCEEDINGS OF THE SEMINAR

2.1 Opening Session

The opening session of the seminar was convened in Lecture Theatre 23, Department of Science, CAST, on Monday, May 9, 1988 at 9: a.m. Dr. Alfred Sangster, President - CAST, in his role as Chairman of this session, welcomed Dr. Abdul Ghafoor Ghaznawi, Programme Specialist Environmental Education, UNESCO, Paris; Mr. Mervyn Claxton, UNESCO Representative to the Caribbean; Dr. Henry Lowe, Permanent Secretary/Executive Director, Science, Technology & Research Department, Ministry of Agriculture, Jamaica, who gave the keynote address; Sub-Regional participants and other guests present. He also used this forum to acknowledge the presence and role of Mr. George Roper, Head of Science Department, Seminar Coordinator and his working team. (For full text, see Appendix 2.1.1).

Against the background of the subject of environment being in the past too often accorded a low priority by developing countries, Mr. Mervyn Claxton in bringing greetings from UNESCO advocated that "Environmental Education is important to the success of any strategy for the protection and the sustained development of the environment with which each and every individual interacts daily". (For full text, see Appendix 2.1.2).

At this point, Dr. Abdul Ghafoor Ghaznawi was called upon to present the objectives, programme of work of the Seminar. Before doing so, he extended a hearty welcome on behalf of UNESCO to the participants. Sincere thanks were also expressed to:

i) the Government of Jamaica for facilitating the organization of the seminar in Kingston;(ii) Dr. Alfred Sangster - President, CAST; Mr. George Roper, Head of the Department of Science, and his working team for the preparation and organization of the seminar; (iii) Sub-Regional countries who had sent participants bearing country reports to the seminar. (For full text, see Appendix 2.1.3).

Dr. Henry Lowe, in his key-note address, expressed the view that the activities surrounding the Incorporation of Environmental Education into the curriculum of Technical and Vocational Institutions " were particularly timely and relevant from the regional perspective in general and Jamaica in particular". He categorically drew reference to the fact that Jamaica, in response to the development of an interesting consciousness about environmental management amongst the CARICOM States had embarked upon a major

environmental strategy thrust, the basis of which was the preparation of the National Environmental Profile and the holding of a Country Consultation on the Environment. To conclude his address, Dr. Lowe reiterated his strong conviction that there is urgent need for a well planned and executed environmental education and training programme in the region. He also emphasized his opinion that "the objective of environmental education is to make individuals and communities understand the complex nature of the natural and built environment, resulting from the interaction of their biological, physical, social, economic and cultural impacts". (For full text, see Appendix 2.1.4).

2.2 **Plenary and Group Sessions**

The first plenary session was chaired by Dr. A. Sangster, President, CAST. Dr. Abdul Ghafoor Ghaznawi pleaded the indulgence of the participants that the next item on the Agenda - "Election of the Seminar Bureau" be reslotted into the afternoon session to allow extra time for deliberations regarding nominees for the positions of Chairman, Vice-Chairman and Rapporteur of the seminar. Dr. Ghaznawi then made a presentation on the UNESCO - UNEP International Environmental Education Programme (IEEP). This he introduced by giving background information on the formation of the UNESCO/UNEP-IEEP which was enacted at the UNESCO Secretariat in Paris in 1975. Also imparted was data regarding:

i) The long and short-term goals of the UNESCO-UNEP International Environmental Education Program.

ii) Exchange of information.

iii) Research and experimentation activities.

iv) Materials preparation

v) Training of key personnel; and

vi) International cooperation.

At the beginning of the afternoon session and under the chairmanship of Dr. Sangster, the participants duly elected the officers of the Seminar Bureau. Mr. Roger Marville, Chairman, took over and conducted the session on the presentation of the Country Reports of Barbados, Cuba, Dominica, Guyana, Grenada and Antigua which enlightened the participants on environmental problems peculiar to their respective countries and the present status regarding the existence of Environmental Education in their schools curricula.

On Tuesday, May 10th, the participants from Jamaica, St. Lucia and St. Vincent and the Grenadines presented their country reports sharing environmental problems and discussing policies for the incorporation of EE in the respective educational systems.

This was followed by the presentation and discussion of UNESCO working document - Environmental Education in Technical and Vocational Education. The afternoon session was devoted to the presentation of another UNESCO working document - Strategies for the Incorporation of Environmental Education into the Curriculum and Teacher Training for Industrial Schools. The case studies prepared by UNESCO in respect of Singapore, Czechoslovakia and Jamaica were presented in the second session of the afternoon. The participants got a comparative picture of the status of EE in industrial education and teacher training in these three countries.

On Wednesday, May 11 two working groups went into session with each working group electing a Chairman, Vice-Chairman and a Rapporteur. The groups discussed the Terms of Reference and decided to address curriculum content first and foremost using the ages 13-18 as the target population for EE in TVE. At the end of the day each group emerged with EE modules based on different approaches. It was decided at the plenary session that each group could continue to develop its modules separately but discuss and develop common methodologies and evaluation parameters in the plenary sessions.

On Thursday, May 12, each group continued its work and reported in the plenary session at the end of the day. Modules were completed through group work on the morning of Friday, May 13. The afternoon plenary session was devoted to EE methodologies, evaluation and developing guidelines on the incorporation of EE into technical and vocational education.

On Saturday May 14, the groups in a plenary session formulated suggested activities and documents in EE to be developed by IEEP at national and regional levels.

The Educational Field trip was organized for the participants on May 15. Report of the Field Trip is separately given in Appendix 6.

On May 16 morning session, the participants discussed the draft report submitted by the Rapporteur and suggested necessary changes. CAST and UNESCO were requested to complete and edit the draft report in the light of the last plenary discussions.

Closing Session

The Valediction session was held at 11:30 a.m. on 16th May, 1988.

Dr. Alfred Sangster, President, CAST and Chairman of the Organizing Committee of the Seminar, in his opening remarks expressed appreciation for the team work of the delegates and the organizers. He also made particular mention of Dr. Abdul Ghaznawi whose facilitating attitude enhanced his serving as a guiding light throughout the seminar. (For full text see Appendix 2.2.1).

Seminar Coordinator, Mr. George Roper, expressed his gratitude to the College council through its President, Dr. Sangster as the host department for organizing and delivering the Seminar. On behalf of the College, gratitude was also expressed to UNESCO it the honour of hosting the Seminar. (For full text see Appendix 2.2.3).

The Keynote Address was presented by Mr. Silvano Briceno, UNEP, Caribbean Regional Representative. Mr. Briceno encouraged the participants to return to their respective countries with a committment to the incorporation of EE into TVE. He also spoke on the UNEP environmental training network. (For full text see Appendix 2.2.4).

On behalf of the participants, Mr. Giles Romulus from St. Lucia expressed sincere gratitude and appreciation to UNESCO and Dr. Ghaznawi, to Dr. Sangster and the Organizing Committee, to the Resource Persons and last but not least to the Office and Ancillary Staff for providing all the facilities and hospitality. (For full text see Appendix 2.2.2).

The participants at this stage of the proceedings staged an impromptu skit which depicted the problems likely to be encountered in an attempt to introduce new concepts in education to the respective ministries. This was well received by the audience.

Dr. Ghaznawi, during his closing statement emphasized that environmental education is a very forceful tool, in educational renewal, and reinforced his view that it is now time to take advantage of this contribution of EE and, have it incorporated into all types and levels of education within in the Caribbean. (For full text see Appendix 2.2.5).

3. PRESENTATION ON UNESCO-UNEP INTERNATIONAL ENVIRONMENTAL EDUCATION PROGRAMME (IEEP)

Dr. Abdul Ghafoor Ghaznawi, Programme Specialist, UNESCO, Paris

3.1 Background

The UNESCO-UNEP International Environmental Education Programme (IEEP) was put into action at the UNESCO Secretariat in Paris in 1975. This programme was a direct outcome of Recommendation 96 of the United Nations Conference on Human Environment, Stockholm, Sweden, 1972, which stated that "It is recommended that the Secretary-General, the organizations of the United Nations System, especially UNESCO, and the other international agencies concerned, should, after consultation and agreement, take the necessary steps to establish an international programme in environmental education, interdisciplinary in approach, in school and out-of-school, encompassing all levels of education and directed towards the general public, in particular the ordinary citizen... with a view to educating him as to the simple steps he might take, within his means, to manage and control his environment".

It is on the basis of the above that environmental education has emerged as a continuous process to provide its target groups through constant renewal of its approach, contents and methods, with knowledge that is geared to changing conditions of the environment.

3.2 Goals

3.2.1 Long-term goals

The general objective of IEEP is to promote implementation of the Recommendations of the Tbilisi Intergovernmental Conference on Environmental Education (1977). More particularly it is to encourage and assist governments, national and regional and international institutions to incorporate environmental education into educational systems, programmes and procedures in order to:

- make people aware of the nature of the relationship between man and the environment on which he depends;
- impart knowledge and skills to solve environment and development related problems; and
- enable people to acquire attitudes, motivations and behaviour patterns likely to contribute to the protection and improvement of the environment.

3.2.2 **Short-term goals**

(i) To encourage and assist Member States, national regional and international institutions, selectively to develop the manpower and educational resources necessary for teaching environmental education at the primary and secondary school and university levels, technical and vocational education and education of the general public;

(ii) To promote use of EE materials developed under earlier phases of IEEP to all regions and countries after adaptation;

(iii) To promote and assist governments and universities to develop and incorporate environmental education in their programmes and courses.

3.2.3 **Activities**

IEEP's activities may be summarized under Exchange of Information and Experience, Research and Experimentation, Training of Key Personnel, Preparation of Materials and International Cooperation.

(i) **Exchange of Information**

The main activities of IEEP in this area can be summarized as: publication of "Connect" in 5 languages and its distribution to 13,000 professionals and institutions; compilation and issuance of a Glossary of EE terms; updated bibliography on environmental education as well as directories on institutions, projects and activities in EE. Three consultation meetings and 13 expert meetings organized by IEEP have also fostered this aspect of IEEP's activities.

(ii) **Research and Experimentation**

IEEP's research and experimentation activities have involved an international survey of EE needs and priorities; surveys on curriculum development and teacher training in EE, survey and studies on the incorporation of EE into university general education; studies on the development of guidelines for the incorporation of EE into non-formal education and into technical and vocational education. Similarly, IEEP has supported 41 pilot, experimental and research projects in formal and non-formal environmental education. Furthermore, IEEP has supported the local adaptation of selected EE documents at the national level.

(iii) **Materials Preparation**

IEEP has prepared and distributed approximately 77 documents. This number is increasing. Examples are, sourcebooks, modules, guidelines for developing the curriculum, teacher training in EE as well as non-formal EE. The Environmental Education Series contains 25 documents.

(ix) **Training of Key Personnel**

IEEP's training activities in EE at international, regional, sub-regional and national levels have focused on key personnel such as curriculum developers, teacher educators, educational planners, educational administrators and supervisors, as well as on personnel in rural development and adult education projects for the purpose of their orientation for a better understanding of the philosophy, goals and objectives of EE, as well as becoming familiar with strategies needed for EE development for primary and secondary schools, for pre-service and in-service teacher training and for its incorporation into non-formal education. It is in this context that one international training course, 5 regional and 12 sub-regional training seminars, as well as 50 national training workshops in the Arab States, Asia, Africa, Latin America, the Caribbean and Europe have been organized by IEEP.

(x) **International Cooperation**

Most of the activities implemented by IEEP have an international cooperation dimension which has been enhanced through fielding advisory missions concerning EE training activities, curriculum development and pilot projects. Similarly, nine EE regional and international meetings and conferences organized by governmental and non-governmental organizations have been supported by IEEP.

Four concrete examples from the list of activities mentioned above, undertaken by I.E.E.P at the international and national levels, are the following:

1. **Intergovernmental Conference on Environmental Education, Tibilsi, U.S.S.R, 1977.** More than six hundred experts and high level decision makers at the ministerial level attended the above conference. The most outstanding outcomes of the above conference are the set of goals, objectives and guiding principles of EE and a set of strategies for the incorporation of EE into all types and levels of education. These have served as catalysts in educational renewal at national and international levels.

2. **International Congress on EE and Training, Moscow, USSR,1987.** This congress was organized ten years after the Tbilisi Conference and took stock of EE experiences gained in the last decade and formulated strategies for the development of EE in the 1990's. The Congress attended by 300 experts from 85 countries recommended the 1990's as the Decade of EE. It further recommended that an International Congress be organised in 1995 to examine EE needs towards the 21st century.

3. I.E.E.P has collaborated with educational institutions (N.C.E.R.T and N.I.E.P.A) in India in the development of EE from 1976. It was in 1986 that India formulated its Education Policy-1986 which contains EE as an essential element from pre-primary school to tertiary level. This national mandate has mobilized Indian educational institutions to take needed action on the incorporation of EE into all types and levels of education.

4. I.E.E.P. has been collaborating with educational institutions in Malaysia on the development of EE. Recent educational renewal in Malaysia has led to the substitution of five classical subjects of history, geography, science, health and civics by a single subject entitled "Man and the Environment" at Grades 4,5 and 6.

4. PRESENTATION AND DISCUSSION OF COUNTRY REPORTS

4.1. Nine country reports, (for summaries, see Appendix 8), were presented during the Seminar; each reviewing the environmental dimensions of their country's problems, the existing system of industrial education and the extent to which EE components are already incorporated into the schools' curricula are highlighted in this section of the report. These country reports were prepared on the basis of a common outline provided by UNESCO consisting of the following major elements;

a) Introduction

b) Major environmental problems of the country and measures taken for their solution and prevention

c) Current industrial education programme, objective approaches to implementation, results obtained and problems encountered at pre-university level

d) The environmental dimensions of industrial education mentioned above (curriculum and teacher training)

e) Suggested priorities for the development of EE in the context of industrial education

f) Suggested strategies for the incorporation of EE in industrial education

g) Conclusion

4.2. The majority of countries represented at the Seminar had common patterns of socio-economic development and varying levels of commitment towards the effective management of their environment and the solution and prevention of environmental problems.

Environmental problems common to most Member States centered mainly on aspects of deforestation, solid and liquid waste management, wild life and habitat destruction, as well as general problems associated with urbanization and land use and development.

In almost all countries the lack of effective legislation and/or poor enforcement procedures were seen as a major constraining factor towards effective environmental control and management.

4.3. **The Major Environmental problems identified by countries are outlined in the following sections:**

4.3.1. **ANTIGUA**

- Deforestation and soil erosion;
- Land pollution;
- Beach erosion;
- Marine pollution.

4.3.2. **BARBADOS**

- Beach erosion and marine pollution due to construction of groynes and gabions near beaches, and waste disposal
- Solid waste disposal;
- Oil pollution due to oil spills around the island
- Ash disposal from sugar industry operations;
- Chemical and hazardous waste disposal creating pollution of underground water;
- Health and social problems caused by quarrying resulting in damage to property;
- Disposal of derelict vehicles;
- Non-functioning of sewage treatment plants resulting in sea and land pollution.

4.3.3. **CUBA**

- Contamination of surface and underground water, bays, rivers, and other sources
- Defective sewage services;
- Soil erosion and faulty drainage systems;
- Diminution of vegetation due to felling of trees by burning, drought and forest fires;
- Vanishing of flora and fauna.

4.3.4. **DOMINICA**

- Air pollution due to dust, carbon monoxide, soot and sulphur fumes;
- Water pollution;
- Natural disasters;
- Soil erosion and deforestation;
- Wild-life destruction;
- Refuse disposal;
- Bad land use management.

4.3.5. **GRENADA**

- Soil erosion, deforestation and careless land use;
- Coastal erosion and reef damage;
- Reduction in water supply due to excessive deforestation;
- Depletion of fish population due to erection of yachting marinas, resulting in the destruction of mangrove swamps;
- Industrial waste disposal both solid and liquid mainly from paint, plastics, tyres, foam and nutmeg industries;
- Disposal problems of nutmeg shells.

4.3.6. **GUYANA**

- Water supply problems in sandy and clayey regions;
- The unreliability of electric supplies and shortage of water supply due to power supply;
- Energy problems due to high import oil costs;

- Population migration from rural to urban areas affecting shelter and water supply;
- Water pollution from industrial waste and oil;
- Air and noise pollution from industrialisation;
- Drainage and irrigation problems in clay belts where agriculture is predominant;
- Depletion of non-renewable resources;
- Soil erosion;
- Solid waste disposal and pollution of air and water due to incineration of solid waste.

4.3.7. **JAMAICA**

- Increase in growth of population at about 1.7% per annum;
- Pollution of sea, beaches, rivers due to industrial effluent, sewage and garbage;
- Soil erosion and deforestation;
- Air and noise pollution in urban areas;
- Floods causing problems to health and agriculture;
- Destruction of marine life due to water pollution especially in Kingston harbour;
- Poor landscaping due to solid waste disposal including old motor vehicles - aesthetics;
- Mosquito breeding in most polluted areas;
- Pollution due to "red mud" from the bauxite industry.

4.3.8. **ST. LUCIA**

- Deforestation and soil erosion;
- Bad agricultural land use and practices;
- Impact of agro-chemicals banned in other countries;

- Pollution of water, air and land;
- Solid and liquid waste disposal;
- Coastal problems due to pollution, mining of sand and the hotel industry;
- Urban congestion and "land capture".

4.3.9. **ST. VINCENT & THE GRENADINES**

- Industrialisation, is the major cause of environmental problems
- Littering;
- Beach erosion;
- Soil erosion and deforestation;
- River pollution due to chemicals used in agriculture.

4.4. **Measures Taken for Prevention/minimization of Environmental Problems**

4.4.1. **ANTIGUA**

- Afforestation, education and effective legislation;
- Litter Act enforcement;
- Sand mining has been temporarily discontinued.

4.4.2. **BARBADOS**

- Planting of trees on the beaches in order to improve beach stability;
- Consideration at alternate methods for solid waste disposal;
- Supervision of oil spills by Ministry of Health and National Conservation Commission;
- Sugar factories are trying to reduce the ash content, caused by the burning of canefields;
- Water zoning.

4.4.3. **CUBA**

- Government took action for efficient sewage disposal systems, and reduction of contamination of water;
- Restoration the beaches with high levels of pollution;
- Establishment of a co-ordinated action for environmental information referring to the values of flora and fauna;
- Observance of the air investigation and pollution detection systems.
- Reafforestation.

4.4.4. **DOMINICA**

- Maximum use of existing agricultural lands;
- Public education and awareness programmes;
- Greater co-ordination between agencies in planning and implementation of projects;
- Legislation enforcement for indiscriminate cutting down of trees;
- Forest extension and preservation.

4.4.5. **GRENADA**

- Land use policies and education campaign for soil erosion and deforestation;
- Afforestation was launched;
- Government has set up management policies aimed at controlling deforestation;
- Attempt made to make the society aware of the impact of industrial pollution.
- Establishment of National parks and protected areas.

4.4.6. **GUYANA**

- More wells and effective preventive maintenance are ongoing exercises;
- Adoption of alternate energy sources such as biogas and solar energy;
- Replacing and upgrading of facilities and equipment for sewage treatment and disposal.

4.4.7. **JAMAICA**

- Different groups organised seminars, workshops, conferences and meetings dealing with EE;
- Through these conferences an effort was made to highlight pollution problems;
- The Office of Disaster Preparedness (ODP) launched an awareness education progamme about natural disasters;
- Flood Plain Mapping Project was launched;
- Re-afforestation programmes;
- Mud dry-stacking areas built;
- Hope River Watershed Management launched;
- In 1987, "one million" tree planting campaign launched to change people's attitude towards land degradation;
- The Urban Development Corporation (UDC) through Metropolitan Parks and Markets (MPM) started clean-up of city streets and gullies;
- The Town and Country Planning Department started regulating developmental activities.
- Legislation in progress to update existing laws and to institute the National Resource Conservation Division as a Statutory Body with main responsibility to monitor and coordinate all environmental management programmes.

4.4.8. **ST. LUCIA**

- The Department of Forestry, since the 1970's has been involved in education of the entire population alerting the nation to the concomitant repercussions of deforestation. Since then more effective legislation for forest, soil and water conservation has been introduced.

- The Department has also started an afforestation programme for the entire island;

- Government recently completed a Land Registration and Titling Project which will help with the formulation of a Land Management Plan;

- Revision and enforcement of the Litter Act;

- The laudable efforts of the St. Lucia National Trust and NGO's in managing protected areas, for example, national parks.

4.4.9. **ST. VINCENT & THE GRENADINES**

- Forestry Division's involvement in setting up a St. Vincent & the Grenadines Environmental Society to educate Vincentians about EE;

- In 1987, the Government passed an Act for the protection of wild life.

4.5. **Current Industrial Education Programmes**

4.5.1. **ANTIGUA**

The industrial programmes in Antigua operate at a number of Levels. The Engineering Department at the Antigua State College offers courses in Automechanical, Electrical Installation, Electronics and Refrigeration. The Teacher Training Department includes in its programme Industrial Arts and Home Economics.

There is a Non-Skills Training Project under the auspices of the Ministry of Economic Affairs. This project is aimed at improving the employability of young persons who have left school.

At the Antigua and Barbuda Technical and Vocational Centre an introductory course for post-primary students, similar to the one at the Engineering Department of the State College is conducted. In addition, similar programmes are offered as part of the Government's Schools Programme.

Objectives

- to improve the quality of life in the state.
- to provide appropriate skills for individuals.

Problems Encountered

No significant problems encountered.

4.5.2. **BARBADOS**

The Industrial Arts Programme ia an essential component of the general education of all students at the Junior Secondary stage. Basic programmes of industrial arts education in the Barbados Secondary School Certificate Stage I examination consist of optional units such as applied electricity and electronics, metal work, technical drawing, woodwork and ceramics. These projects are laboratory based. A senior secondary programme is promoted by CXC in industrial education.

Objectives

The general objectives common to industrial education are as follows:

- To develop an active interest in industrial life and in methods and problems of production;
- To develop an appreciation of good design and workmanship;
- To develop habits of self reliance and resourcefulness;
- To develop a cooperative attitude;
- To develop health and safety practices;
- To develop an interest in achievement and habits for orderly performance.

Approaches to implementation

- The on-going training of teachers, bearing in mind the rapid technological advances, is of paramount importance to the implementation of the programme;

- The upgrading and maintenance of workshops cannot be ignored if students are to be in stride with the "state of the art;"

- Wherever possible, students are placed in attachment programmes in the industrial estates to allow for "hands on" experience;

Problems encountered

- The high cost of materials, buildings and machinery;

- The absence of technicians to service equipment;

- The rapid advancement of technology, rendering equipment outdated;

- The high cost of teacher training.

4.5.3. **CUBA**

The technical and vocation education system as a sub-system of the National System of Education gives continuity to primary and secondary schools. The application of work-study programmes gives students the possibility to work in production and service centres related to labour profiles.

Objectives

The objectives are as follows:

- Social, useful work development;

- Participation in development and production processes;

Approaches to implementation

Approach should be through activities and development of groups with scientific/technical interest persons.

Problems encountered

No special problems encountered.

4.5.4. **DOMINICA**

At the Technical College, the curriculum meets the needs of the growing industrial sector. These include City and Guilds programmes in electrical and mechanical technician, electrical and electronic craft, carpentry and joinery, refrigeration,plumbing, and agriculture. At the junior secondary school level, students are introduced to engineering drawing, metal work, safety, woodwork, electronics, electrical wiring, among others.

Objectives

The main objectives of the TVE are to meet the local industrial demand and to introduce primary school students to technical subjects.

4.5.5. **GRENADA**

A policy was formulated to provide a conceptual framework and operational pattern for technical education in Grenada. Under the Youth Skills Training Programme various technical courses were started in 1986. These include plumbing and pipe-fitting, industrial sewing, electrical installation and automotive mechanics. The curriculum of industrial education at school level is based on International Labour Organization (ILO) and the modules of employable skills. The subject areas in the "O" level examination are woodwork, metal work, plumbing, auto mechanics, and technical drawing. Various courses offered for primary and secondary schools leavers at the Grenada Technical and Vocational Institute and the St. David's Technical Education Centre include: automotive mechanics, refrigeration, electricity, drafting, shorthand and typing.

Objectives

The general objectives of technical and vocational education in Grenada are:

- To offer technical education in all-age schools;
- To introduce pre-vocational technical education in secondary schools;
- To improve and develop the Grenada Technical and Vocational Institute to offer higher levels of training;
- To develop curriculum to meet the needs of technical and vocational education;
- To alleviate youth unemployment;
- To supply training in skills which are needed in the local industries.

Approaches to implementation

Instructors were sent abroad for training for the implementation of technical education. A policy has been formulated to provide a conceptual framework and operational pattern for technical education in Grenada.

Problems encountered

About 2,000 persons were trained in various areas and recruitment for trainees is currently taking place. No major problems are encountered.

4.5.6. **GUYANA**

In Guyana, technical education is available in the areas of building, business and engineering. The Carnegie School of Home Economics curriculum deals with aspects of food handling and hygiene.

Objectives

- To ensure that the technical programmes will enhance the well-being of citizens;
- To ensure the importance of environmental practices in relation to home economics and industrial education.

Approaches to implementation

The approach to implementation should be based on a suitable syllabus and the target group. Additional information would have to be included so that the entire programme can be implemented successfully.

Problems encountered

Attraction of young persons with suitable academic background for industrial education is a national problem in some areas.

4.5.7. **JAMAICA**

In Jamaica, industrial education institutions at the secondary level comprise technical high schools, comprehensive schools, vocational schools, HEART academies and trade training centres. Advanced training is also offered at the Vocational Training Development Institute (VTDI), the College of Agriculture (COA) and the College of Arts, Science and Technology, (CAST).

The specialised courses offered at technical high schools include auto-mechanics, building construction, electrical installation and electronics, machine shop and fitting, steel fabrication and welding, commercial studies, home economics, and agriculture. The vocational students spend a greater portion of their time on practical work.

Objectives

In general, the objectives of the curriculum of technical and vocational schools place emphasis on the understanding of the basic skills related to industrial needs. These are reflected in the current CXC Vocational Proficiency Certification Examination.

Approaches to implementation

The general subjects in technical schools have inputs of general aspects of the environment. Most of the courses for technical and vocational education are not interdisciplinary.Incorporation of EE should be considered as a requirement. The curriculum should include few topics such as water, water quality, treatment and pollutants, pollution control and disposal of sewage but a special curricula on EE will not be suitable.

Problems encountered

The low level of public awareness is a major problem restraining the implementation of EE objectives in current industrial education programmes.

4.5.8. ST. LUCIA

The Division of Technical Education and Management Studies of the Sir Aurthur Lewis Community College offers diploma courses in Construction, Plumbing and Welding.

Here aspects of the environment are infused in the curriculum. There is however need for greater emphasis on EE.

The St. Lucia School of Agriculture also provides a two-year course which has extensive EE components. Students are made aware of problems and are taught abatement techniques.

4.5.9. ST. VINCENT & THE GRENADINES

Primary schools provide basic skills training in woodwork and technical drawing. The multi-island project has been launched in the areas of wood/metal works, metal/pipe fitting, auto mechanics and electricity. The Bequia Anglican High School runs courses in wood/metal works and technical drawing up to CXC level.

Objectives

- To increase knowledge in technical and vocational studies.

4.6. Environmental Dimension Of Industrial Education

4.6.1. ANTIGUA

The student in industrial education is part of three environments, namely;

a) the inner or working environment
b) the environment of the institution
c) the wider environment of the island and the world.

The inner environment is dealt with in most programmes but the other two are often omitted.

4.6.2. BARBADOS

The pedagogy is not linked to the specific needs of health and safety programmes. There is no linkage of EE aspects due to low priority of environment. There is a failure of curriculum committees to include an environmental component in industrial arts programme.

4.6.3. CUBA

Several years ago EE was added in the curriculum of the primary and middle level school system. In the Pedagogical High level (University) Institution it was added as extra curricular activities. In teacher training, the EE related topics are ecology, environmental control and importance of EE. The objectives of EE in technical and vocational education teachers' training include the complex nature of the environment, consciousness concerning the protection and improvement of the environment and the development skills that make possible scientific participation on environmental protection.

The curriculum to be developed should include environment and environmental pollution, ecology, alternatives for environmental protection and concepts of EE.

4.6.4. DOMINICA

It has been noted that the current programmes in industrial education have no significant focus on environmental areas.

4.6.5 **GRENADA**

Currently there are no environmental aspects in industrial education. Properties of raw materials, waste products, by-product recovery or alternate uses of waste product should be introduced in the teaching of technical subjects.

4.6.6. **GUYANA**

The EE dimensions of industrial education are integrated into the health and safety aspects of the curriculum. The Environmental components presently exist in the curriculum at the primary and secondary level. The community high schools of National Industrial Educational Programme curriculum consists of a few related topics such as agriculture, wood waste disposal and hygiene. In the industrial teacher training curriculum there is a component on safe use of organic and inorganic matter.

4.6.7. **JAMAICA**

The integrated science curriculum in technical and vocational schools is closely related to the physical and biophysical environment. There are no specific EE objectives reflected in most of the current curricula in teacher training colleges. In the technical teacher education at CAST and VTDI, specific objectives on EE are minimal. At the teachers' training colleges, courses such as geography, social science and science consist of EE related topics due to the nature of these subjects.

4.6.8. **ST. LUCIA**

In the Division of Science and General Studies, the Geography syllabus has a significant environmental component. The Natural Sciences, namely, Physics, Chemistry and Biology also include topics on the environment with varying degrees of emphasis.

The Teacher Training curriculum includes EE in its Social Studies and General Science courses. Aspects of drainage surface water and sewage disposal are also included in the Technical Education curriculum.

The Agricultural curriculum at the St. Lucia School of Agriculture includes aspects of environmental conservation, resource management, ecology wildlife and forestry. EE is infused in certain subject areas at the TVE level but not sufficiently emphasised.

4.6.9. **ST VINCENT & THE GRENADINES**

Apart from the current program on agriculture which deals with soil conservation, etc, no specific areas of EE are reflected in the curriculum of industrial schools. EE certainly has a place in TVE and should be taught in an inter-disciplinary manner.

4.7. **Suggested Priorities for the Development of EE**

4.7.1. **ANTIGUA**

- A national policy on EE;
- A Ministry should accept responsibility for EE;
- CARICOM Ministers' meeting to assist in making a Ministry responsible for the environment;
- Network and establishment of linkages between Ministries at all levels;
- Special workshops and seminars for various interest groups;
- Review of, and upgrading of existing syllabuses with issues on the environment;
- A sensitised public, aware of the need to care the environment through media education;
- Analysis and careful documentation of environmental problems in Antigua;
- Preparation, dissemination and utilisation of modules on EE;
- Training of teachers, administrators and parents;
- Modules should concentrate on not just the cognitive but more importantly, the affective domain, and appropriate teaching and evaluation strategies should be emphasised.

4.7.2. **BARBADOS**

- Introduce a subject "EE" for industrial arts;
- Training of teachers should be considered as a vital element;

- Technical Institute must offer formal training on environmental matters;

- Environmental aspects should be of concern to the entire community;

- A Committee should be formed from related government departments and institutions for the formulation of a suitable programme;

- The implementation of programmes on EE should include periodic inservice training for teachers;

- Formulation and adoption of appropriate environmental standards.

4.7.3. **CUBA**

- To train teachers for pegagogical high level institutes for TVE;

- To confirm a pedagological principles system for EE based on the Tibilsi Conference;

- To insert the EE dimensions in the present curriculum;

- To relate the teaching with more investigative activities.

4.7.4. **DOMINICA**

- Despite the limited focus on EE in the existing curriculum no urgent need to take up the incorporation of EE components on a priority basis is indicated.

4.7.5. **GRENADA**

- Preparation of syllabus/programme depending upon the needs;

- Production of teachers' package for training;

- Research on local problems;

- Participation with other countries for resource materials;

- Preparation of a directory of resource persons of Member States.

4.7.6. **GUYANA**

- Need must be considered in the context of local problems;
- Components of EE identified should create interrelationships with other topics;
- EE should be timetabled as a separate curriculum;
- Subject values should be broken down into elements, subtopics and assembled as modules.

4.7.7. **JAMAICA**

- There is a need for the establishment of a Ministry of Environment, comprehensive environmental legislation and enforcement of existing laws;
- All local and regional examinations such as Caribbean Examination Council, (CXC) and Certificate of Secondary Education, (CSC) should have EE components;
- CARICOM countries should consider common environmental problems and seek solutions.

4.7.8. **ST. LUCIA**

- Government should have a clear policy to incorporate EE into its overall educational planning;
- There is need for organised workshops for teachers on environmental topics;
- The University of the West Indies (UWI), through other associated departments must act as a pioneer in EE.
- Teacher training in EE should be a priority;
- Greater consideration within and among government departments on environmental issues and EE.
- Need for a Caribbean Association of Environmental Educators.
- Greater public participation;

4.7.9. **ST. VINCENT & THE GRENADINES**

- Teacher training in EE;
- Producing textbooks with main objectives of EE.

4.8. **Suggested Strategies**

4.8.1. **ANTIGUA**

- In technical institutions where the programme is still flexible, it is advisable that EE be made a part of general knowledge courses such as social or physical environmental education;
- In secondary schools where the syllabuses are less flexible, teachers should be trained to infuse EE into the existing programmes.

4.8.2. **BARBADOS**

- Training of teachers in EE.
- Curriculum development in EE.

4.8.3. **CUBA**

- Incorporation of EE should be with general subjects and units linked to electrical, mechanical, building and agricultural industry problems;
- Elaboration of a methodological guide for EE syllabuses and supportive materials;
- Development of EE courses in selected institutions.
- Evaluation of the social order and results that come out of the practical application of the courses.

4.8.4. **DOMINICA**

EE in TVE should be implemented through:

- Environmental education committee;
- Curriculum development unit;
- In-service training unit;
- Village councils and youth groups.

4.8.5. **GRENADA**

- Emphasis on EE;
- Teacher training;
- Promote general awareness to the public through non-formal education;
- Infusion of EE into existing TVE curricula.

4.8.6. **GUYANA**

- Considering the multidisciplinary nature of EE, it should be reinforced in the industrial education, safety education, training curriculum for public health inspectors;
- Discussions, seminars, workshops, field trips must be organised;
- Government must introduce EE programmes;
- Information related to correct attitudes must be adopted.

4.8.7. **JAMAICA**

- A strategy for EE incorporation would be the "infusion" model;
- Another strategy would be the pre-training and in-service training of teachers in the industrial educational institutions;
- There should be cooperation between environment protection agencies and technical training institutions;
- CXC involvement is highly necessary to incorporate EE in various related curricula;
- The role of mass media is also important for environmental awareness;

4.8.8. **ST. LUCIA**

Two strategies for the incorporation of EE in industrial education and teachers' training are as follows:

- Development and introduction of new or revised syllabuses along with organisation of seminar/workshop for the school teachers and students;

- Gradual implementation at EE into the curriculum, with the assistance and cooperation of regional/international agencies.

4.8.9. **ST. VINCENT & THE GRENADINES**

- Officials of the Ministry of Education should collaborate with training institutions;

- Convince Government of the importance of EE programmes;

- Organise public awareness programmes.

4.9. **Main Discussion Points**

The following represents a general synthesis of the main discussion points bearing on the presentations.

4.9.1 **Environmental Problems**

Acute deforestation and its reprucussions, general environmental pollution, poor coastal zone management, growing industrial pollution including indiscriminate agro-industrial practices, destructive land use and urban congestion were identified as important environmental problems generally applicable to most member states.

The need for increased public awareness programmes supported by more effective environmental legislation and enforcement policies were seen by participants as key strategies in helping to address many of these problems at the national and regional level.

4.9.2 **Environmental Dimension of Environmental Education**

Environmental education in TVE was cited as generally lacking in terms of formal imputs into the curriculum.

Few countries, excluding Cuba, have made any significant formal attempts to integrate EE into their technical and vocational training programmes. Teacher Training in all territories lacked formal EE objectives, although aspects of EE could be found in some subject areas, specifically those related to the social and natural sciences.

4.9.3 Suggested Priorities and Strategies for the Development of EE

The need for each member state to adopt a National Policy on EE was raised as well as the necessity of having intersectoral committees, comprising government departments, private sector agencies and training institutions was identified as a key strategy for the development of EE.

Integration of EE components into existing syllabi was cited as a necessary step and that local and regional Examining Bodies should reflect EE components in their subject curricula.

Teacher training programmes incorporating EE was a priority and this should be supported by curriculum development in EE. Pre-training and inservice training of industrial/technical teachers with respect to EE was also identified as another important strategy for the development of Environmental Education.

5. PRESENTATION AND DISCUSSION OF WORKING DOCUMENTS

5.1 Two main documents and three case studies were presented and discussed as listed below:

TITLE	PRESENTER
Environmental Education in Technical and Vocational Education, UNESCO (EE 24).	Dr. Joyce Glasgow
Strategies for the Incorporation of Environmental Education into Curriculum and Teacher Training For Industrial Schools, UNESCO.	Mr. Milton Pinnock
Case Study on the Incorporation of Environmental Education into Curriculum and Teacher Training of Technical Schools in Singapore, UNESCO.	Mr. Andreas Oberli
Case Study on the Incorporation of Environmental Education in Curriculum and Teacher Training of Technical Schools in Czechoslovakia, UNESCO.	Ms. Vilma McClenan
Case Study on Incorporation of Environmental Education into Curriculum and Teacher Training of Technical Schools in Jamaica, UNESCO.	Mr. Yogen Saxena

Resumes of each of the above documents are given in Appendix 7.

5.2 **Discussion Points**

In the discussion on EE-24 a wide range of themes were raised. It was generally agreed that incorporation of EE into TVE depends very much on policy and decision-making persons. Other important suggestions made were as follows:-

* Trainers must perfect the art of communicating necessary information to those who must get it.

* EE must be considered in the framework of other issues affecting the society.

* The leaders in the promotion of EE should be trained technologists who can interface between higher and lower technical levels.

* EE could be well placed in cross-faculty courses at all levels.

* At tertiary levels, projects should involve people in different specializations resulting in cross fertilization.

* Each society must see the importance of making its own decisions on what is sustainable development for itself.

* Project reports should be made available to Government officials, e.g. "Principles of Design" for removing dust particles from emissions.

In the discussion of the document entitled "Strategies for the Incorporation of Environmental Education into Curriculum and Teacher Training for Industrial Schools" the following points were raised:

* It is necessary at the very outset to decide on what we want to achieve through incorporation of Environmental Education in Industrial Schools.

* The first positive step is to establish objectives and guiding principles.

* We are not training Environmentalists but creating an awareness and developing attitudes with respect to environmental protection among industrial school graduates.

* Environmental Education has a positive role to play in environmental change since environmental degradation is essentially industry-based.

* Industrial Education Institutions already have some basic resources which can support the incorporation of Environmental Education, buildings, laboratories, equipment and teachers.

* The greatest difficulty envisioned in the incorporation of Environmental Education into Industrial Education is national policy support from respective governments.

In the discussion on the Case Study on "Incorporation of Environmental Education into the Curriculum and Teacher Training of Technical Schools in Singapore" the following points were raised:

* The introduction of laws, regulations and guidelines could strengthen EE inputs into TVE.

* Singapore favors the full integration of EE into the curriculum as opposed to EE as separate subject courses.

* Better preparation of teachers through pre and in-service EE programs seems desirable.

* The idea of regional exchange of teaching/learning materials should be encouraged generally. In the case of Singapore, the spectrum of EE topics would have to be broadened in order to satisfy neighboring countries.

* The case study provides important information on EE in a highly industrialized and entirely urban country. It is therefore useful to the Caribbean situation with regards to pollution control, water treatment, industrial safety and other environmental concerns. Environmental Control and Environmental Science are tailored to the specific civic and industrial engineering requirements of a man-made environment only.

* Many Caribbean countries are confronted with problems such as soil loss and flash flooding as a result of deforestation, coastal flooding resultant on coral reef and mangrove forest destruction, poor zoning and planning policies, poor engineering of roads, bridges and aqueducts. Agriculture is one of the main economic activities in the Caribbean and contamination of water catchments and rivers is often results from poor agricultural practices. These problems are presently of at least the same magnitude as industrial pollution.

* EE in TVE for the Caribbean has to focus on the man-made environment as well as on the delicate state of the natural environment. Land-use policies have to be developed. EIA, of Physical planning, zoning environmental management technology for the both man-made and natural environment have to be taught at our institutions.

* EE from kindergarten to secondary school must become the subject of a regional effort.

In the discussion on the case study on the "Incorporation of Environmental Education in the School Curriculum and Teacher Training of Technical Schools in Czechoslovakia" the following points were raised:

* Our situation in the sub-region is seemingly far removed from that in Czechoslovakia. However, there are elements in their program which could be of assistance to us.

* The level of "political will" that is evident in Czechoslovakia is higher than that of the sub-region.

* In order to effect changes in the sub-region towards EE attitudes will have to be influenced. Teachers will have to be specially trained in order to be well equipped for the role.

* The "landlocked" situation of the country of Czechoslovakia has served as a stimulant for the incorporation of EE into the curriculum. We in the Caribbean must be cognisant of international cooperation and show recognition of and cooperation with our neighbors instead of a continued conflict and narrow insular approaches.

In the discussion of the "Case Study on the Incorporation of Environmental Education into the Curriculum and Teacher Training of Technical Schools in Jamaica", the following points were raised:

* The introduction of legislation or a National Environmental policy would increase EE inputs into TVE.

* Tertiary institutions should include EE components in their curricula.

* The EE emphasis should be based on local environmental problems and issues.

* Teacher training on EE should be considered a priority.

6. ENVIRONMENTAL EDUCATION MATERIALS DEVELOPED BY THE SEMINAR

On the basis of identified national and regional environmental problems and the needs for the incorporation of EE into industrial education, participants went into group work to develop a series of EE modules to serve as prototype materials for consideration of educational institutions that may be interested to adapt them to serve local needs. Group I developed two EE modules based on the problem-solving approach while Group II developed seven thematic modules.

The above modules are followed by a teacher training module, suggested methodologies, evaluation techniques in EE and guidelines for the incorporation of EE into industrial schools. These were developed in plenary sessions.

6.1 Modules Based on the Problem-solving Approach

Introduction

From the international to the national level, environmental deterioration has become a major concern and issue. Deforestation and its repercussions, as well as pollution and waste management have all had their negative impacts on ecosystems. In the past, the insatiable desire for economic growth ensured the emergence of an eco-destructive attitude which today, can only be changed by environmental education (EE) at all levels of society. If man wants to continue to live in a healthy environment he must obey the fundamental laws of nature, especially those concerning the man-environment relationship, or else encounter increasingly serious environmental problems all detrimental to his well-being.

The basic philosophy of EE is, therefore, to seek to change man's attitude through environmental sensitization, increased awareness and knowledge, and to impart basic skills for effective community participation. The ultimate goal is national, regional and international conscientization leading to positive action for the protection and improvement of the environment.

Rationale for EE

Recommendation No. 1 of the Tbilisi Conference (1977) has outlined the basic goal of EE:

> "to succeed in making individuals and communities understand the complex nature and built environment resulting from the interaction of the biological, physical, social, economic and cultural aspects, and acquire the knowledge, value, attitudes and practical skills to participate in a responsible and effective way in anticipating and solving environmental problems, and in the management of the quality of the environment".

The basic rationalization for EE is therefore that man cannot:

: continue to damage and/or destroy the environment on which all life depends;

: tolerate ignorance and apathy at any level;

Therefore it is necessary to:

: educate all levels to the population so that they are aware of the results of their impact on the environment and are therefore able to act responsibly;

: ultimately impart skills to all persons so as to evoke positive and effective action when faced with environmental problems and issues;

: develop an appreciation and love for nature that will direct man's mode of behaviour.

It is important that all men are made to understand that "we have not inherited the earth from our parents, we have [only] borrowed it from our children" (World Conservation Strategy, 1980). The need for Ee is really the need for mankind to survive. Man cannot continue to denude the environment with impurity.

General Objectives for EE

1. To explain the complex nature of the environment as a result of interaction and interdependence among the biological, physical, social, economic, technological, political and cultural aspects/factors.

2. To develop the correct attitudes, conscious self-discipline, commitment and action necessary for the improvement protection of the environment on which all life depends.

3. To develop the appropriate skills necessary for effective personal and national participation in solving environmental problems.

4. To develop appropriate corrective behavioural patterns to cope with current and future threats to the environment.

Environmental Education for Technical and Vocational Education

The material developed has been divided into two modules.

Module I - "Man in His Environment"

Module II - "EE in Technical Vocational Education (TVE).

Why two modules?

Technical personnel need to have a background of general EE since they are exposed to general environmental problems and risks in the same way as other people. This general background is provided in Module I. TVE needs , however, it has to go beyond general sensitization. Technical personnel in their training need to learn how to identify and evaluate:-

- the effects of their professional work on the environment;
- the risks to nature at large involved in the types of operations they perform;
- the environmental properties of the new materials they are using of the processes they are designing or controlling;
- the risks involved in carrying out the processes above; both to those performing them, and to other human beings, as well as to the flora, fauna, soil, air, water in the immediate as well as in further environments.

These areas are dealt with in Module II

6.1.1 **Module I**

Man and His Environment

Categorization of problems

Several problem areas are dealt with in the module viz.

- pollution;
- coastal zone mismanagement;
- wild life and massive life extinction;
- deforestation;
- solid and liquid waste disposal;
- overpopulation.

Specific objectives

Each should be treated as a unit, and at the end of each, the student should

1. be able to analyse each environmental problem using a holistic framework;

2. be able to identify local, regional and international examples of each problem and evaluate the degree of success or failure of any corrective measure taken;

3. have acquired some skills for dealing with each problem.

The problem solving approach is proposed for teaching this module. Details of the content for each unit are outlined in Table 6.1. It should be used, as necessary, to inform the steps listed in the problem-solving approach.

Conceptual Framework The Problem Solving Approach - 1

Inherent in man's behaviour and subsequent interaction with the environment is the generation of conflicts. Such conflicts have promoted environmental degradation affecting land, air and water, to the extent that the very survival of man is threatened.

The effects of industrialisation, urbanisation and agriculture among other activities are to a great extent responsible for the environmental problems now confronting man. The effect and extent of these on the environment, however, are dictated by the stage of development, population dynamics and scale. These varying dimensions in turn will influence actions necessary for the solution of resulting problems, and mitigating activities.

Contigent therefore on coping with environmental problems is the need to follow a **Problem Solving Approach** which essentially includes the following steps:

1. Identification of problems, causes and results

2. Establishing priorities;

3. Planning strategies for dealing with problems;

   (a) Best strategy
   (b) Alternative strategies

4. Implementing the strategy;

5. Evaluating the results.

Guiding Principles based on the Problem Solving Approach

Step I - **Identification of the problem**

- institute fact finding mechanism e.g. survey, analysis of existing records;
- define the problem;
- study historical trends;
- determine causal factors;
- examine effects;
- assess impact on the environment.

Step II - **Establishing priorities**

Using a scientific approach establish:

A. Size of the problem on a scale of 0 - 10
   - population at risk;
   - demographic characteristics;
   - area involved.

B. Seriousness of the problem on a scale of 0 - 20;
   - urgency;
   - severity (morbidity and mortality).

C. Effectiveness of the possible solution scale 0 - 10
   - objectives
   - what can be done

D. Consider property economics, acceptance (political); resource, legality (Pearl): scale 0 - 1

To arrive at a priority rating two approaches may be used

(i) $(\frac{A + B}{C})\ C$

(ii) $(\frac{A + B}{3})\ (C \times D)$

Step III **Planning strategies for dealing with problems**

- identify and assess resources available and capabilities;
- develop a management programme;
- share the programme for comment/feedback;
- propose alternate actions.

Step IV **Implementing the strategy**

- prepare resources to function; task force, the public
- implement according to priorities;
- proceed in an orderly sequence.

Step V **Evaluating**

- assess situation on an ongoing basis;
- keep detailed records;
- examine results and assess their possibilities for the present and future.

The content covering each problem/unit is outlined below. It should be used as necessary to inform the steps listed in the problem solving approach.

Table 6.1

CONTENT FOR THE UNITS

PROBLEMS	CAUSES	RESULTS	PREVENTION
A. 1. Air	Factory fumes; Dust; Fires; Cars; Smell from dumps	Health problems, e.g. lung cancer; Acid rain-destruction of buildings reduced visibility	Education(formal & non-formal; Improved Technology.
2. Water, fresh and marine	Domestic, industrial waste,e.g. sewage; shipping discharge	Destruction of aquatic life; Spoilage of beaches;	Enforce legislation Improved treatment plants
3. Nuclear waste Radiation	Nuclear fall-out, e.g. weapon testing and accidents.	Reduction in agricultural production as a result of contamination, e.g. livestock, vegetation; Contamination of air,e.g.Chernobyl disaster, and water supplies.	Development control (Location in special areas).
4. Noise	Discotheques, Aeroplanes, Industries, Vehicles	Sleepless nights leading to nervousness; Hearing disability.	Hearing Aids; Zoning
5. Land	Improper solid and liquid waste disposal	Proliferation of vectors; Decline in aesthetics; Contamination of aquifiers.	Enforced legislation; Proper disposal facilities.

Table 6.1 continued

PROBLEMS	CAUSES	RESULTS	PREVENTION
B. **COASTAL ZONE MISMANAGEMENT**	Sand mining; Dredging; Tourism(impact) Destruction of coastal zone. (vegetation and habitats).	Erosion; Aesthetics deterioration; Destruction of marine life and habitat; Destruction of coral reefs; Alteration of coastal processes, e.g. longshore drift and wave action.	Enforced legislation Location of alternatives to sand, e.g. pumice; planting trees; Construction of artificial reefs.
C. **MARINE LIFE EXTINCTION**	Deforestation and destruction of habitat; Indiscriminate hunting; Chemical pollution.	Endangering and extinction of species.	Enforced legislation; Public education; Formation of Naturalist groups etc.
D. **DEFORESTATION**	Falling of trees for timber, agricultural lands, housing, and fuel, etc.	Soil erosion - splash, beach,gully; Siltation of coral reefs; Rapid evaporation; Changes in climatic conditions - shade, temperature, rainfall; Destruction of habitat; Possible extinction of fauna and flora; Proportional decline in agricultural output with time.	Afforestation; Soil conservation; Terracing; Enforced legislation; Environmental education.

Table 6.1 continued

PROBLEMS	CAUSES	RESULTS	PREVENTION
E. **SOLID & LIQUID WASTE DISPOSAL** 1. Solid waste	Indiscriminate dumping; Littering; Advent of disposables; Absence of bins, pits, etc.	Deterioration in beauty of the landscape; Vector - harborage; Pollution - air, land, water; Fire hazards; Accidents; Scavenging.	Education, legislation, e.g. Litter act; Provision of disposable facilities; Proper management systems: incineration, recycling pulverisation, sanitary landfills.
2. Liquid waste	Domestic effluents; Lack of central sewage disposal systems; Cultural practices; Industrial discharge of effluents (toxic, etc.).	Proliferation of vectors of disease; Water, land pollution; Increased incidence of communicable diseases; Destruction of aquatic life; Aesthetic deterioration.	Education; Provision of facilities for effective disposal; Enforced legislation, etc.
F. **OVER-CROWDING**	Lack of development control plans; Rural/Urban migration; Natural increase in population.	Strain on Resources: - Transportation - Recreational - Social Serv- Aesthetics deterioration; Social decay - crimes, etc; Introduction of new diseases.	Planning and enforcing legislation; Decentralization of services and creation of jobs in the rural areas; Family Planning; Provision of social services.

6.1.2 **Module 2**

Environmental Education in Technical and Vocational Education (TVE)

Specific objectives

At the end of any section of this subject specific module students should:

1. be able to identify the impact of their particular occupations on the environment in relation to waste disposal and other emissions;

2. have the knowledge and skills necessary to implement conservation measures and minimize their negative impact on the environment;

3. be aware of the provisions of all the legislation relevant to their occupations.

INTRODUCTION

Very often students of industrial schools do not have a full understanding of their actions on the environment. The waste oil from an automechanic workshop may have long term effects on water bodies. It is envisaged that students will be sensitized to their impact of these actions on the environment, by infusing EE into the existing curriculum.

In the module, the environment is treated as consisting of two components - the inner environment and the outer or wider environment. The inner environment refers specifically to conditions at the workplace - the factory or farm. The focus is on tasks attendant on organisation at the workplace; the use of equipment; processes carried out and the products made. The outer environment deals with the impact of any occupation on the wider environment.

The wider content of TVE is grouped below into the following subject specific areas:

- Building;
- Mechanical Engineering;
- Refrigeration and Air Conditioning;
- Agriculture;
- Secretarial and Business Studies;
- Home Economics.

For each subject area, suggestions are made as to the courses which each might cover, and some of the risks specific to the subject associated with the inner and outer environments, outlined.

Subject Specific Areas in TVE

A. BUILDING:
Courses: Woodwork;
Building Drawing;
Building Construction;
Carpentry and Joinery;
Plumbing and Pipe Fitting;
Masonry;
Electricity;

The Inner Environment
Organisational Risks:

- storage of lumber, blocks, pipes;
- proper ventilation and lighting;
- electric shock.

Equipment, Process Related Risks:

- noise and dust : wearing of goggles, face masks, earmuffs, protective clothing;
- toxic fumes : solvents used in plumbing;
- cumulative effects of cement on the body (hands);
- soil erosion - removal of grass or trees.

The Outer Environment
Emissions

- remains such as pieces of lumber, P.V.C. pipes, galvanized roofing left lying after construction
- solid and liquid waste disposal;
- overcrowding because of inappropriate zoning;
- PVC pipes: (non-biodegradable may cause problems to marine environment).

Exploitation of Natural Resources:

- Clearing of forests for lumber
- limestone quarry depletion
- sand mining.

B. AUTO MECHANICS

Courses : Body work and spray painting;
Welding - Arc, oxy-acetylene;
Metalwork - Fabrication;
Engine repairs;

THE INNER ENVIRONMENT

Organisational Risks

- proper ventilation;
- observation of safety rules and precautions;
- storage of dangerous material (hazardous).

Equipment/Process/Product Related Risks

- noise and dust - wearing of protective clothing (ear muffs, goggles etc.);
- handling of liquids - e.g. paints, solvents, body filler which might be carcinogenic;
- lifting and carrying heavy loads : proper posture;
- explosions - due to improper handling of potentially explosive material.

THE OUTER ENVIRONMENTS

Emissions

- oil, old cans, tyre disposal - these can be responsible for marine pollution and lead pollution resulting in death of aquatic life, unsightly appearances, proliferation of vectors.
- Dust, metal shavings and poisonous gasses - these may be responsible for lung cancer,blocking of pipes and drains.

Exploitation of Natural Resources

- Mining of resources resulting in:
- depletion on non-renewable fossil fuels and ores.

C. REFRIGERATION AND AIR CONDITIONING

Courses : Refrigeration/Air Conditioning;
Electronics/Electricity
Welding

The Inner Environment

Organisational risks

- proper ventilation;
- electric shock;
- ultraviolet and infrared radiation.

Equipment/Process related risks

- burns, shocks;
- chloroflurocarbons and their effects on the ozone layer.

OUTER ENVIRONMENT

Exploitation of Natural Resources

- exploitation of copper for electrical conductors;
- silicon for chips;
- aluminium for transport industry and domestic use.

D. AGRICULTURE

The Inner Environment

Courses:

- crops
- livestock
- mechanical engineering

Organisational risks

- transportation of pesticides, weedicides etc;
- storage of pesticides etc;
- safety instructions in use of these chemicals;
- maintenance of mororised equipment e.g. tractors;

Equipment/process-related risks:

- health risks associated with constant handling of chemicals which may be carcinogenic over time: the use of protective measures e.g. gloves;

- improper use of spraying equipment;

- improper posture and lack of care in operating machines.

Product-related risks:

- precautions to be taken in the handling and storage of products e.g. refrigeration;

- rules to be observed in the use of foods which have been treated with chemicals.

The Outer Environment

Emissions:

- organic materials from farms, slaughterhouse etc, fertilizers, pesticides etc. may affect the environment

  - directly, causing air pollution
  - through contamination of waterways causing death of aquatic life by poisons, or by overgrowth of algae resulting in oxygen deprivation;

  - through accumulation of toxic substances e.g. DDT in food chains.

Properties of products:

- health risks involved in indiscriminate use of foods sprayed with insecticides;
- probable hormone imbalance problems attendant on modern meat production processes i.e. feed administered to chickens/cattle (under investigation).

Exploitation of Natural Resources:

- selective felling of trees for lumber, paper making etc;

- clearing of land by mechanical means, for example "slash and burn" practices. for planting, resulting in soil erosion, flooding, disturbance of water cycle,loss of species and eventual desertificaton.

Secretarial and Business Studies

The Inner Environment

Organisational risks:

- space organization in offices;
- proper ventilation;
- proper lighting.

Equipment/Process related risks

- sources of potential electrical shocks e.g. faulty typewriters;
- radiation sources for example, word processors and photocopiers
- corrective seating postures;
- environmental health risks e.g. inhaling chemical solvents;
- noise levels and productivity in the office e.g. typewriters, and humming of air conditioners.

Product related risks

- proper disposal of used paper and documents;
- allergies related to handling of end products;

The Outer Environment

Emissions:

- waste paper disposal;
- other form of waste, e.g. containers of ink, chemicals etc.

Exploitation of Natural Resources

- impact of paper production on trees e.g. deforestation;
  - recycling possiblies;
- possible synergistic effect of chemicals disposed of;
- depletion of renewable and non-renewable resources
  - electricity usage
  - iron and steel etc.

F. **HOME ECONOMICS**

Courses:

- Food and Nutrition
- Clothing and Textile
- Home Management

The Inner Environment

Organisational risks:

- arrangement of workspace for safety e.g. stoves, sewing machines etc;
- application of safety rules;
- proper storage of fuel and other inflammable materials;

Equipment/process related risks:

- preventing accidents: use of protective gloves for hot articles, proper use of gas/electricity fueled equipment
- maintaining health : using strict hygienic standards in the preparation of foods, fresh or preserved.

Product related risks

- Instructions to users as to (a) the shelf life and storage of food products, as well as proper identification of contents (b) maintenance services necessary to keep equipment in order and where these are available.

The Outer Environment

Emissions

- organic material - possibility of contamination of and detergents, water
- non bio-degradable material e.g. plastics;
- noise from machinery e.g. in garment factory and from electronic devices, electrical appliances etc;
- Dust from textiles;

Properties of products

- health risks involved in under-preparation or improper preservation of foods;
- possible allergic reactions from synthetic materials e.g. cloth, threads etc.

Exploitation of natural resources

- use of fuel;
- use of irreplaceable metals in building machines, etc.

CONCLUSION

It is imperative that methods of incorporating EE into school curricula be developed and constantly upgraded. In so doing the aim must be for maximum sensitization, resulting in positive action and public participation. Here one module has been presented outlining the **Problem Solving Approach**. Module 2 is subject specific for TVE, and teachers may choose any approach including problem-solving. They are free to modify, improvise and change wherever they see fit.

6.2. Thematic Modules

Introduction:

It is our experience that the majority of students pursuing TVE are those who for one reason or another do not have a strong science background. Therefore, the thematic approach attempts to include elements of pure science in the following seven modules.

6.2.1. Introductory Module 1: Man and his Environment

Preamble

This module is intended to allow the students to appreciate and understand that man is a **part** of the environment and not the master of the environment. They must also realise that all his activities can influence the ecological balance in nature and that he therefore must show a sense of responsibility for the preservation of the environment for the future.

General Objectives

Students should demonstrate:

- an understanding of the environment in its totality;
- an appreciation of its importance;
- an understanding of the effects of man's activities;
- an awareness of their own responsibility in caring for the environment.

CONTENTS

A. - What is the environment?

B. **The natural environment**

i) the components of the natural environment and the role of each:

- water;
- air;
- land;
- plants;
- animals;
- energy;

ii) the relationships among the various components:

- useful and harmful relationships;
- the causes of harmful relationships;
- impact/effect of harmful relationships;

iii) the components as man's life support system; his dependence on air, water, etc.

C. **The Man made Environment**

- cities: their specific problems and effects;
- the urban/rural dichotomy and its social results;
- the effect of man's social, economic, political and;
  religious activities on the environment.

6.2.2. **Module 2: Water**

Preamble

This module is designed to help the student to relate and understand some of the many ways in which water forms a vital part of the environment and the issues concerned with man's use of this resource. The expected outcome is the inculcation of a sense of responsibility for the care of this aspect of the environment, thereby helping to improve the quality of life.

General Objectives

Students should demonstrate:

- an understanding of the sources, functions and uses of water;
- an understanding that different bodies of water are necessary for maintaining life;
- an awareness that man's intentional and unintentional activities can have adverse effects on the natural water cycle and that this ultimately affects the total environment;
- a willingness to demonstrate their responsibility for protection of the environment through the adoption of better personal environmental practices.

MODULE 2 - WATER

CONTENT	SPECIFIC OBJECTIVES STUDENTS ARE REQUIRED TO KNOW AND UNDERSTAND	ISSUES/EFFECTS	CORRECTIVE MEASURES
Sources of water in nature	- rain, rivers, etc; - elements of the water cycle.		
Uses of water	- agricultural, domestic industrial.		
Usage of water	- the various categories of users of water; - the ways in which users can contaminate water; - the various contaminants of water: pesticides, detergents, etc; - the necessity for economy in usage and prevention of wastage of water.	Conservation	
Domestic Water Supplies	- the various sources; - the pattern of usage; - the meaning of water quality; - methods of distribution of domestic water supplies.	Wastage/ Conservation	Conservation Preservation Prevention
The Sea	- the importance of the sea as: . the life support system for marine life . a source of food for man . a means of recreation and transport for man; - reef formation.	Aesthetic value Beach erosion Reef pollution Deforestation Oil Spills Sewerage disposal Dumping of Waste Natural disasters, e.g. hurricanes	

6.2.3. Module 3: Air

Preamble

This module is designed so that students can understand that air may contain many substances other than its natural components and that these substances can result from man's activities. The necessity for minimising these substances as far as possible, so that the air may be kept "clean" is a point of focus.

General Objectives

Students should demonstrate

- an understanding of the importance of air quality;
- an understanding that industrialization can affect air quality and that this in turn upsets the natural balance in the environment;
- an appreciation of the corrective measures that can be taken to maintain good air quality.

Module - 3

AIR

Content	Specific Objectives Students are Required to understand	Issues/Effects	Corrective Measures
Clear Air	- What is clean air? - The composition of air.		
Contamination of Air	- Sources of contamination: . smoke, . exhaust fumes; . emission from factories, chimneys, automobiles; - The nature of some of the various contaminants: . sulphur oxides, . carbon dioxide . carbon monoxide, . nitric oxides.	Contamination	Reduction of the contaminants. Use of scrubbers Tall chimneys
Air Quality	- The adverse effects of contaminants on air quality; - The effect on health when good air quality is not maintained,e.g. respiratory difficulties.		
The Green House effect	- The effect of changes in the concentration of carbon dioxide in the atmosphere.	Earth heating up; Ocean warming up; Flooding.	
Movement of Air	- The consequence of air currents: . trade winds, . offshore/onshore breezes; - The importance of proper ventilation: . building design.	Industrialization	

6.2.4. Module 4: Land

Preamble

This module is intended to allow students to appreciate the importance of land as vital for animal and plant life. It must be emphasised that proper land usage and management are, therefore, important for the maintenance and existence of life.

General Objectives

Students should demonstrate

- an understanding of the various types of land areas and the underlying reasons for their use and care.
- a knowledge of the effects of improper land use and management;
- an understanding of the causes and effects of natural disasters.

Module 4 - LAND

CONTENT	SPECIFIC OBJECTIVES STUDENTS ARE REQUIRED TO UNDERSTAND	ISSUES/EFFECTS	CORRECTIVE MEASURES
Land Areas	- The function of different types of land areas; - mountains; - valleys; - wetlands; - agricultural lands; - forest land; - open spaces; - arid lands.	Planning, Zoning Aesthetic value	Planning Zoning
Land Usage	- The proper use of land; - The problems connected with land usage: - erosion of coastal land, agricultural land, hillsides, - drainage.	Dumping; Deforestation; Hillside cultivation; Over-grazing; Mining.	Controlling; of these misuses; Environmentally sound farming techniques.
Deforestation	- The problems attendant on land scarcity in any country; - The effects of "slash & burn" practices; - The effects of the forest industry.	Watershed management; Soil erosion; Reef destruction; Destruction of habitats; Reduction of species diversity.	Re-afforestation Proper measures for hillside cultivation; Artificial reefs;
Natural Disasters	- The common disasters that are applicable to the territory: - hurricanes, earthquakes, etc, - the precautionary measures which may be taken in each case.	Landslides; Floods.	Disaster preparedness

6.2.5. **Module 5: Plants**

Preamble

This module is intended to give students a knowledge of the major uses and importance of plants, so that they can develop an appreciation for the preservation of plant life. The module also emphasises that man's activity is having a devastating effect on plant life and that he must therefore begin to act more responsibly in order to correct this trend.

General Objectives

Students should;

- understand the importance of preserving all plant life but especially rare and endemic plant species;
- understand the necessity for maintaining forests;
- understand that man's destruction of plant life is irreversible.

Module 5 - PLANTS

CONTENT	SPECIFIC OBJECTIVES STUDENTS ARE REQUIRED TO UNDERSTAND	ISSUES/EFFECTS	CORRECTIVE MEASURES
Plant types-	The importance of plant life for: - food, shelter, - photosynthesis as the process for energy in food chains; - The uses of plants - economic; - wild; - pharmaceutical; - poisonous plants; - The importance of man's activity on plant life.	Preservation of endemic and rate plants; Documentation of indigenous and endemic species. Natural floods.	Knowledge for Protection; Establishment of protected areas e.g. National Parks; Legislation.
Tropical Forests	- The global and local situation with regard to forests, especially the rate of disappearance; - Different forest types: - mountain forest, - coastal etc; - The effects of deforestation; - The importance of forests in maintaining watersheds.	Deforestation; Re-Afforestation; Land erosion; Water cycle; Air quality; Weather; Aquatic life Aesthetic value;	Re-Afforestation Seeking alternatives for the use of timber; Re-evaluation of the price of timber.(Increase of value on your local timber) replacing charcoal by subsiding the cost of kerosene; Watershed management.
Farming	- The importance of using recommended farming techniques: - erosion control, etc.	Proper land use and zoning.	Proper land use and zoning(Town & Country planning); Extension services.

6.2.6. **Module 6: Animals**

Preamble

This module is intended to highlight the interaction between different kinds of animals. It emphasises also that man needs to be concerned about his intentional and unintentional destruction of animal life, especially wild life, so that his overall attitude towards all animals in his environment be changed.

General Objectives

Students should:

- understand the necessity for preserving animal life;
- understand the effects of man's activity on the destruction of animal life.

Module 6 -ANIMALS

CONTENT	SPECIFIC OBJECTIVES STUDENTS ARE REQUIRED TO UNDERSTAND	ISSUES/EFFECTS	CORRECTIVE MEASURES
Domestic Animals	- The use of animals.	Endangered species	Prevention of slaughter;
Wild Animals	- The common wild animals, in the specific countries; - The impact of man's activity on all animals including himself. - The value of animal species.	Endemism; Interdependence Wilful and unconscious destruction of wild life; Loss of genetic pool; Aesthetic value.	Legislation; Preservation of habitats; Management of ecosystems; Using recommended quantities of pesticides Public education.

6.2.7. Module 7: ENERGY

Preamble

The energy man uses comes directly from the environment and includes renewable and non-renewable sources. If non-renewable sources are not effectively managed they will be depleted. At the same time, use of these energy resources can result in significant pollution of the environment. This module is intended to provide the student with an understanding of the effects of the uses of these resources by industry as well as management of corrective measures that can be taken to conserve and minimise their pollution effects. Health and safety aspects are also emphasised.

General Objectives

The student should

- show an understanding of the effects of pollutants from energy sources;
- understand that the effects of these pollutants can be reduced by initial controlling strategies;
- understand that health and safety is of prime importance in planning for the use of these energy sources.

Module 7 - ENERGY

CONTENT	SPECIFIC OBJECTIVES STUDENTS ARE REQUIRED TO UNDERSTAND	ISSUES/EFFECTS	CORRECTIVE MEASURES
Non-renewable-energy sources	That some energy resources cannot be renewed;	Conservation;	Installation of controlling devices;
	- The use made of these sources,	Waste disposals; Consideration of resources;	Monitoring of discharge of waste from marine vessels;
	- The proper management of these resources e.g. coal and oil.	Expensive infrastructure; Reduced efficiency	International legislation (Laws of the Sea)
Renewable energy sources	- That some energy resources are renewable, e.g. hydro, solar,wind, wave.	Limited usage.	
Health and Safety	- The proper usage of energy-related equipment;	Health	
	- The possible health hazards connected with their use;	Pollution and oil spills	
	- Arc eye,		Welding behind screens, use of shields
	- earthing,		
	- exposure to ultra-violet rays,		
	- radiation.		
Power plants-	the main pollutants from power plants and their effects on the environment.	Land Pollution Water Pollution Air Pollution	Installation of controlling devices

6.3 ENVIRONMENTAL EDUCATION COURSE FOR TEACHER TRAINING

TARGET GROUP : TECHNICAL AND GENERAL SCIENCE TEACHERS

Method of Implementation : Summer Workshops

Pre-amble

This module is intended to help teachers to appreciate and understand that **man** is a part of the environment and must therefore realize that his activities can have effects on the environment. He must, therefore, show a sense of responsibility and concern for preserving and improving the environment.

It should be recognized that all teacher training programmes, including those for environmental education, should include exposure to the following areas :

(a) The formulation of objectives - (i) Cognitive
(ii) Affective
(iii) Psychomotor

(b) Content areas
(c) Teaching strategies
(d) Evaluation strategies including techniques of writing questions, for example,

- Multiple choice items;
- Essay - open and structured;
- Short answer questions.

(e) Class Management.

Objectives

Teachers should :

- understand the environment and its importance
- understand the effects of man's activities on land, air, water, plants, animals and energy resources;
- understand how these effects can be corrected and prevented
- appreciate the interdisciplinary nature of EE and become acquainted with the possibilities for team reaching in this context;
- demonstrate a willingness to change personal practices in order to enhance knowledge and significance of the environment.

COURSE CONTENT

A The Environment

- its importance;
- components of the environment - biological, physical, socio-cultural, economic, political;

B Resources and their limits.

- conservation as the rational use and management of the resources of the environment;
- environmental resources and development.

C Major Environmental concerns - Local/Regional/Global

- resource depletion;
- opulation dynamics (movements, growth etc);
- energy crisis / and or war.

D Major Environmental Impacts.

E Environmental Problems concerning Water, Air, Land.

- pollution

F The Environment and Public Health.

- water pollution;
- air;
- solid waste management;
- sewage disposal;
- the work environment - occupational health, industrial hygiene and safety;
- environmental health aspects of disasters.

G i) Environmental Law / Legislation

- local;
- international

ii) Environmental Ethics

H Environmental Impact Assessment (EIA)

- an understanding of the concept only.

I The Environment and the Future.

J Environmental education as a measure for the prevention and solution of environmental problems.

6.4 Teaching Methodologies for Environmental Education

AN OUTLINE

Cognitive (knowledge)	Affective (attitudes)	Psychomotor(skills)
1. Lecture	Role Playing	Project - Planting Trees etc
2. Lecture/ Demonstration	Debates	Experiments
3. Discussions	Case Studies	Lab. exercises
4. Field Trips/ Projects	Community involvement	Field Trips
5. Games	Competitions	
6. Simulations	Industrial Fairs	
7. Debates	Values Clarification Exercises	

Evaluation Strategies

Written	Anecdotal	Practical
1. Essays	Viva	Lab.Exercises
2. Multiple Choice Items	Conferencing and observations	Micro & Macro Teaching
3. True and False		
4. Short Answer Questions		
5. Project Assessment		Sociograms
6. Questionnaires		Peer & Group Analysis
7. Check Lists		
8. Surveys		

6.5 Evaluation Techniques

It will be necessary to evaluate any EE programme with specific reference to the teaching methods being employed, because of the interdisciplinary nature and the newness of the subject. If, as is the recommended, a problem solving approach is used, it would be advisable to devise evaluation instruments. Such instruments may be used by teachers as well as education officers in any territory.

The problem solving approach adopted in formal education will require more time, and the ability of the teacher to keep the topic always in focus. These concerns should inform the evaluation process.

6.6. GUIDELINES FOR THE DEVELOPMENT OF EE

A. Policy

There is need for a government policy on environmental education. This policy should:

i) capture the government's recognition of natural and global issues relating to environmental matters;

ii) contain explicit statements on its position regarding various local and regional environmental issues;

iii) give clear guidelines as to the responsibilities of government departments and how they should interact;

iv) address the promulgation of legislation in order to be in step with progressive modern technology;

v) have a clear statement on formal and non-formal education.

B. Network for Information Sharing

There is an urgent need for a regional network for the collection, storage and sharing of information. Such a network should be linked to international information sources, for example, UNEP's INFOTERRA.

In the Caribbean, it is possible for the Centre for Resource Management and Environmental Studies (CERMES) to be an information centre for the Eastern Caribbean, the College of Arts, Science and Technology (CAST) and the University of the West Indies (UWI) to perform similar functions in the Western Caribbean.

In so doing, an indispensable reservoir of environmental information would be provided for decision makers, researchers, teachers and students.

C. Training of Teachers, Administrators and Parents

The training of teachers, administrators and parents must be seen as an integral part of the successful delivery of environmental education. This training could be done through workshops and seminars, which would utilise audio-visuals, self-directed learning materials; and through printed materials such as modules on environmental education.

D. **Revision of and/or Creation of Curricula**

There is need to analyse existing technical teacher training and vocational education curricula in order to:

i) identify present and needed environmental elements

ii) incorporate EE by:

- infusing EE elements into present curricula,
- developing new syllabuses for addition to existing curricula, or
- by adopting a combination of both these strategies;

iii) develop appropriate modules on EE.

E. **Delegation of Responsibility**

The Ministry of Education should be made responsible for both formal and non-formal environmental education. In doing so it will act as the focal point for co-ordinating the various agencies which are concerned with the environment.

F. **Public Sensitization**

There is need for the public to be better informed on environmental concerns through a non-formal educational approach. This approach should seek to initiate action at the community level.

G. **Co-operation within and among Government Departments**

There is need for an effective system of co-operation and consultation within and among government departments. Such a network would enhance the circulation of information essential in the decision making process. In addition, expertise can be shared among these departments and will help to establish and maintain national standards.

H. **Involvement of Regional and International Bodies**

Regional and international bodies can act as catalysts for the initiation of action on EE. The material and manpower resources of agencies and institutions such as UNESCO, UNEP, CAST, CERMES and UWI should be tapped and used to complement national and regional efforts.

7. SUGGESTED ACTIVITIES AND DOCUMENTS IDENTIFIED BY THE SEMINAR TO BE DEVELOPED BY IEEP

7.1 National Training Workshops and Seminars

7.1.1 Target Groups

- Teachers and School adminstrators
- Business and industrial sectors, hotielers and Non-Governmental Organisations (NGO's)
- Policy makers in various ministries
- Science Clubs / Teachers Associations
- Service Clubs - Lions, Rotarians, others.
- Youth Clubs - 4H, Guides, others.
- Church and community groups
- Media workers, with the purpose of reaching the wider population through the press, radio, television, (including the use of dramatic presentations).

7.1.2 Objectives

i. To expose the above target groups to varying environmental problems, their causes, and results.

ii. To acquaint possible personal and public action for their control and prevention.

iii. To develop an awareness for the need of environmental education in all areas and at all levels of formal and non-formal education.

iv. To stimulate public consciousness which will result in joint and cooperative action.

7.2 LOCAL AND REGIONAL RESEARCH

7.2.1 To support local operational research activities designed to:

i. identify specific environmental issues

ii. establish a statistical data base.

7.2.2 **To support research activities with respect to teaching/learning processes in environmental education.**

7.3 **Provision of Material**

7.3.1 To provide financial resources for obtaining and having access to related international/regional publications on environmental education such as journals, books, booklets, slides, film / film strips and posters.

7.3.2 Assistance in the preparation, production and dissemination of regional and local materials in environmental education.

7.4 **Fellowships and Attachments.**

7.4.1 i. To assist in identifying appropriate institutons and areas of study.
ii. To provide funding as necessary.

7.4.2 Target Group

- Key educational personnel responsible for the development of EE in the context of formal and nonformal education, technical and vocational education and university general education.

7.5 Short term consultancy services relevent to curriculum development and/or teacher training in EE.

7.6 Collaboration with existing organisations in providing funds for materials and in establishing linkages and facilitating interaction.

7.7 **Documents.**

7.7.1 There is need for the development of EE modules for various groups from primary to tertiary levels.

7.7.2 Pamphlets, Periodicals, Posters, Stickers, Magazines and Cartoons for Non-formal Education

- Business Sector

- Interest Groups.

A-1 TIME TABLE

DAY/TIME	FORENOON SESSION 9 am - 12:30 Pm	AFTERNOON SESSION 2 - 5:30 pm
Monday 9,May 1988	1. Registration 2. Opening Session 3. Presentation of Unesco-Unep International Environmental Education Programme	4. Election of Officers for Seminar Bureau. 5.Presentation of Country Reports. 6. Steering Committee Meeting
Tuesday 10 May 1988	7. Presentation of Country Reports (cont'd) 8. Presentation and Discussion of Working Document "Environmental Education in Technical and Vocational Education.	9Presentation and Discussion of Working Document "Strategies for the Incorporation of Environmental Education in Industrial Schools " 10Case Study on the Incorporation of Environmental Education (EE) into the School Curriculum and Teacher Training for Industrial Schools in Singapore. 11Case Study on the Incorporation of Environmental Education (EE) into the School Curriculum and Teacher Training for Industrial Schools in Czechoslovakia. 12Case Study on the Incorporation of Environmental Education (EE) into the School Curriculum and Teacher Training in Jamaica. 13Formation of Two Working Groups. 14Steering Committee Meeting

A-1 TIME TABLE CONT'D

DAY/TIME	FORENOON SESSION 9 am - 12:30 Pm	AFTERNOON SESSION 2 - 5:30 pm
Wednesday 11 May	15. Group Work on The Incorporation of Environmental Education into The Curriculum of and Training for Industrial Schools in the Caribbean.	16Group Work Continues 17Steering Committee Meeting
Thursday 12 May 1988	18. Group Work Continues	19Group Work Continues 20Steering Committe Meeting
Friday 13 May 1988	21. Group Work Continues	22Preparation and Presentation of Group Reports 22Steering Committee Meeting
Saturday 14 May 1988	23.Consolidation of Group Reports 24. Suggested Documents and Activities on the Incorporation of **EE** into Industrial Education to be Developed by **IEEP** at Sub-Regional and International levels.	24Suggested Documents and Activities on the Incorporation of **EE** into Industrial Education to be Developed by **IEEP** at Sub-Regional and International levels.
Sunday 15 May 1988	25. Exhibition and Tour of Environmental Sites	25Exhibition and Tour of Environmental Sites
Monday 16 May 1988	26. Study of Draft Report of The Seminar **NOTE** **LUNCH BREAK** **12:30 - 2:00 pm** **MORNING COFFEE / TEA BREAK** **10:30 - 10:45 am** **AFTERNOON COFFEE / TEA BREAK** **3:30 - 3:45 pm**	27Closing Session

A.2 OPENING AND CLOSING SPEECHES

A.2.1 OPENING SPEECHES

A.2.1.1 WELCOME ADDRESS

Dr. Alfred Sangster
President
College of Arts, Science
& Technology

Ladies and Gentlemen, I am very pleased to have this opportunity to welcome all of you to CAST and to the opening of this UNESCO sponsored seminar on the Incorporation of Environmental Education into the Curriculum of Industrial Education for the Caribbean.

I would like to extend a special welcome to the following people; Dr. Henry Lowe, our Keynote Speaker who is the Executive Director of Science and Technology and Research in the Ministry of Agriculture, Mr. Mervyn Claxton, UNESCO Regional Representative to the Caribbean, Dr. Abdul Ghafoor Ghaznawi, UNESCO Representative from Paris, participants from the Commonwealth Caribbean and Cuba.

I would like to commend and thank Mr. George Roper, Seminar Coordinator, and his assistants, Ms. Janet Bedasse and Ms. Sharon Hay-Webster who have done a great deal of the pre-seminar planning.

I hope that this seminar will be a productive exercise and that the participants will make the most of this important training opportunity. I am sure that the shared experiences will be rich, varied and worthwhile and will facilitate the pursuance of new directions when you return home.

Man has the propensity to destroy life and also to make it bearable or unbearable on this planet. He must therefore learn to live in harmony with his environment. Environmental perservation should therefore be a necessary concern of all humans beings. As educators and concerned individuals we need to be mindful of the need to raise the conciousness of young people to appreciate their environment.

CAST is honoured at being asked by UNESCO to organize this seminar. It is encouraging to see the good attendance of persons who are seriously concerned with issues associated with the environment. I again welcome you all most sincerely and wish the seminar well. I now ask Mr. Mervyn Claxton, UNESCO Regional Representative to the Caribbean to bring greetings from UNESCO.

A.2.1.2 **INAUGURAL ADDRESS**

Mr. Mervyn Claxton
UNESCO Representative to
the Caribbean

Mr. Chairman, distinguished guests, participants in the training seminar, ladies and gentlemen, it is indeed a pleasure for me to be here today to participate in the Opening Ceremony of this important training seminar which is hosted by CAST and funded and sponsored by UNESCO in association with the United Nations Environment Programme (UNEP).

Public awareness of problems affecting the environment, which can be defined as a global support system for human life, began to develop in the early 1970's, leading to the United Nations Conference on the Human Environment which was held in Stockholm in 1972 and which in turn led to the establishment of the United Nations Environment Programme.

UNESCO was, from the very beginning, involved in this movement of growing consciousness of environmental values. In 1971 UNESCO launched "Man and the Biosphere", an international and inter-disciplinary programme which places emphasis on research and training in the natural and social dimensions of the environment.

Four years later, in 1975, UNESCO, in cooperation with UNEP, introduced programmes in environmental education on which my colleague, Mr Ghaznawi, will elaborate later. Furthermore, the UNESCO Convention on the Protection of the World Cultural and Natural Heritage, which was adopted in 1972, requires all participating countries, of which there are now 100, to protect and preserve, for future generations, the cultural and natural sites approved for inclusion in the World Heritage List.

The subject of the environment has, in the past, been too often accorded a low priority by developing countries which have tended to dismiss it as a fashionable topic among developed countries and even seen as an obstacle to development. However, the fairly recent and rapid internationalisation of environmental problems illustrated by the worldwide effects of nuclear fallout fron the Chernobyl disaster, the threat to the ozone layer by chlorox fluorocarbons, the attempts to dispose of North American industrial waste in the Caribbean, the problem of acid rain, made widely-known by the pop singer, Prince, have brought home to developing countries, and to the Caribbean, the realization that they cannot remain "islands unto themselves".

At the national level, environmental issues should not only be addressed with respect to their negative aspects which are dealt with in terms of damage limitations, for example, reducing the rate of land erosion, deforestation, pollution of coastal waters by effluents, etc., but also positively, with a view to seizing opportunities for development from a more rational use and, in environmental terms, a more intelligent exploitation of resources. Scientific and technological development, for example, could be directed towards the proper exploitation of environmental resources to improve efficiency in the use of raw materials and energy and to the utilisation of recycled waste and waste materials.

One should not forget the importance of preserving and protecting the environment as a valuable amenity and the need to respect the right of everyone to enjoy it. Here, perhaps, I shall cite the example of the growing problem of noise pollution which is almost always overlooked when environmental problems are discussed. No urban dweller nowadays is unexposed to the high decibel nuisance of blaring car horns, portable transistor radios public sound systems, and the doctored mufflers of motor-cycles. Very few developing countries have legal regulations to deal with these problems, and where such laws exist, they are seldom enforced.

Positive, environmentally intelligent exploitation of the natural resources is more important for all island-developing countries like the Caribbean than for developed countries.

Because islands tend to have only a limited range of exploitable resources, the options for ecologically and economically sustained development are restricted. On smaller islands the margin for error can indeed be small. Even a comparatively minor miscalculation over the accepted level of forest exploitation, could seriously endanger the water supply, diminish animal wildlife and result in excessive soil erosion and sedimentation with consequent adverse effects on coastal marine resources.

It goes without saying that it is crucially important for developing countries, like those in the Caribbean, to actively pursue policies for the promotion of economic and social development. This could best be done, however, by the integration of environment policies and development strategies in order to provide for the satisfaction of present economic needs, while at the same time, ensuring the long term conservation of the natural resources on which their development depends. To take tourism as an example, a balance should be struck between exploiting the tourist potential of the region's beaches and coastal waters, on

the one hand, and protecting, on the other hand, those very resources from over-exploitation and consequent degradation which would effectively reduce their potential as tourist attractions.

Environment education is important to the success of any strategy for the protection and the balanced development of the environment with which each and every individual interacts daily, for better or for worse. Education is therefore the key to making people aware of the impact of their actions on the environment, both at the individual and at the community level, as well as the long term consequences of such actions on their own economic and social lives.

I do hope that the opportunity presented to the participants in this Seminar to exchange ideas, information and experiences on this most important subject, will assist them in designing relevant programmes for Technical and Vocational Schools.

I thank you.

A.2.1.3 STATEMENT FOR THE OPENING SESSION

Dr. Abdul Ghafoor Ghaznawi
Programme Specialist in
Environmental Education
UNESCO, Paris

Mr. Chairman, Ladies and Gentlemen,

It is indeed a privilege for me to welcome you on behalf of Unesco to this Subregional Training Seminar on the Incorporation of Environmental Education into Industrial Education for the Caribbean, which is organized by the College of Arts, Science and Technology, in co-operation with Unesco-UNEP International Environmental Education Programme and Budget for 1986-1987.

The objectives of the seminar are:

(i) To study the place of and need for environmental education (EE) in the context of technical and vocational education (TVE);

(ii) To develop strategies for the incorporation of EE into the curriculum and teacher training for pre-university industrial schools;

(iii) To develop prototype EE materials for incorporation into the curriculum of industrial schools;

(iv) To enhance exchange of information and experience through the preparation and presentation of country reports in the development of EE in the context of technical and vocational education among the participating Member States;

(v) To identify documents and activities to be developed by IEEP at subregional, regional and international levels on the incorporation of EE into technical and vocational education.

Inputs to the seminar include a series of Unesco documents entitled: The Place of Environmental Education in Technical and Vocational Education; Strategies for the Incorporation of Environmental Education into Curriculum and Teacher Training for Industrial Schools and Case Studies on the incorporation of environmental education into Industrial Education in Jamaica, Singapore and Czechoslovakia. Similarly, an important input to the seminar will be the presentation and discussion of country reports which have been prepared by the participants.

The envisaged output of the seminar will be a group of trained curriculum developers and/or teacher educators in industrial education on developing strategies and guidelines that could facilitate the task of incorporating environmental education into the whole process of industrial education based on their national and territorial needs and priorities.

The participants of the seminar shall devote about three days of intensive work to the preparation of the above-mentioned guidelines through group work. This will be an important output produced by the participants and it will form an important chapter of the final report of the seminar, which will also include the proceedings of the seminar, an integrated summary of country reports, summaries of working documents and information on the participants. The final report will be prepared here during the seminar, examined at the last plenary session, printed soon after the seminar and distributed to the participants of this seminar and interested institutions in the development of environmental education. The report of this seminar shall be fed, as a substantive input, into similar seminars organized by Unesco in other regions.

Ladies and Gentlemen, I should like to add that this is not the first and the last environmental education activity of Unesco in the Caribbean. Unesco organized with the collaboration of Ministry of Education of Antigua in 1980 the Subregional Training Workshop on Environmental Education for the Caribbean. Unesco organized in collaboration with the Faculty of Education of University of West Indies, in Jamaica, the Subregional Workshop on Teacher Training in Environmental Education for the Caribbean in 1983. Unesco organized in collaboration with Guyana University in 1987 the Subregional Training Seminar on Non-formal Environmental Education for the Caribbean. This Subregional Training Seminar on the Incorporation of Environmental Education into Industrial Education for the Caribbean which is being organized in 1988 is the fourth one in this series. As a follow up to the subregional training seminars, Unesco has rendered support for the preparation and organization of national training seminars in environmental education in Costa Rica (1979), Guyana (1981), Jamaica (1981 and Cuba (1986). In the area of material preparation in environmental education, Unesco collaborated with the Faculty of Education of Jamaica in the preparation of a document entitled "Environmental Education: Module for Pre-service Training of Teachers and Supervisors for Primary Schools". This document has been printed in English and French and disseminated internationally. A Case Study on the Incorporation of Environmental Education into Industrial Education in Jamaica has been under preparation by the College of Arts, Science and Technology for this seminar. Unesco envisages to prepare with interested educational institutions of the sub-region, a

prototype environmental education dimension of curricula for primary schools and for primary teacher training. Unesco is also studying the possibility of rendering support to the incorporation of environmental education into university general education.

Ladies and Gentlemen,

Environmental Education is an educational process through which is imparted to its target groups the essential environmental sensitivity, awareness, knowledge, skills, attitudes, commitments, actions and ethics for the purpose of protection and improvement of the environment and its quality for the present and future generations.

Thus, the target groups of environmental education are those in formal and nonformal education, the decision makers and the general public at large. Among the target groups there are those, like the industry's skilled and semi-skilled workers and technicians, whose actions and decisions may have immediate as well as long-term impact on the indoor and outdoor environment with respect to environmental safety and sanitation, resource utilisation, and prevention of environmental degradation and problems. Putting it differently, it would be difficult to find a situation where industrial personnel trained through industrial education do not put their immediate and long-term impact on the indoor and outdoor environment. Hence, the need for the incorporation of environmental education into industrial education so that graduates of industrial schools may become aware and knowledgeable of the immediate and long-term impact of their intervention and work in the environment on all members of a society. Similarly, the graduates of industrial schools should become skilled, committed, active and ethically responsible for the solution and prevention of environmental problems which could lead to the protection and improvement of the environment.

For achieving the above, it becomes a priority to search for ways and means for the incorporation of environmental education into industrial education. In this context Unesco has organized a Consultation Meeting (Singapore, 1986) and a Subregional Training Seminar (New Delhi, 1987) and has prepared a few case studies. Reports of the above meeting and seminar and copies of the case studies have been made available for your study during this seminar.

On behalf of Unesco I want to thank the Government of Jamaica for facilitating the organization of this subregional training seminar here in Jamaica. The efforts and contributions of the College of Arts, Science and Technology in the preparation and organization of the seminar is most appreciated. I want to thank the Member States that have been kind enough to accept the invitation and send their respective participants to this

seminar. Participants were delegated the task of preparing country reports. I thank them for achieving this task and for joining us in the seminar. Last but not least, I express my gratitude to my colleagues, Mr. Claxton and Mr. Simon Clarke from the Unesco Sub-regional Office for the Caribbean, for their full support in the preparation and organization of this seminar.

Unesco hopes that the deliberations and results of this seminar will lead to environmental protection and improvement in the Caribbean.

A.2.1.4 **KEYNOTE ADDRESS**

Dr. Henry I.C. Lowe
Permanent Secretary/Executive Director
Science, Technology & Research Department
Ministry of Agriculture, Jamaica.

Mr. Chairman, Dr. Alfred Sangster, President of CAST; Mr. Claxton, UNESCO's Representative; Dr. A. Ghafoor Ghazwani, UNESCO's Representative; Mr. George Roper, Seminar Co-ordinator; representatives from participating Caribbean Islands, other distinguished guests, members of the press, ladies and gentlemen. It is a privilege and honour to share with you some of my observations and thoughts on Environmental Education and in particular, the incorporation of this subject into the Technical and Vocational Education System.

But before doing so, let me first remind you of the objectives of this seminar. The following are the three objectives as I understand them:

1. to study the place of and need for environmental education (EE) in the context of technical and vocational education;

2. to develop strategies for the incorporation of EE into the curricula for teacher training for pre-university industrial schools; and

3. to develop prototype EE for incorporation into the curriculum and teacher training for industrial schools.

This new activity with its specific objectives is particularly timely and relevant from the regional perspective in general and Jamaica in particular. It has been observed that Jamaica, and indeed the rest of the CARICOM states, are now developing an interesting consciousness about environmental management, which needs nurturing and support. Jamaica, in response to this, has embarked upon a major environmental management strategy and thrust, the basis of which is the preparation of the National Environmental Profile and the holding of a National Consultation on Environment which, to all intents and purposes, is going quite successfully. My understanding is that other CARICOM countries, and in particular, Trinidad and Tobago, are now basically preparing to follow Jamaica's leadership in this area, for which we are very pleased.

Mr. Chairman, I wish to commend the growth of environmental awareness linked to the impressive numbers of environmental organizations, government ministries and agencies; the review and expansion of national environmental legislations and the emergence of the environment as a political issue; all these are significant signposts, indicating that the environmental issues in the region are permanent factors of growing importance. This will ensure that environmental management will become an integral part of the tasks and responsibilities of both the public and private sectors, and their representative organizations, as well as the community at large.

However, in order for the full potential of this to be realised, industrial and other commercial organizations can best serve their own interest and the nation as a whole, by promoting the common environmental interests and concerns, in relation to the various interest groups involved, such as their workers, the governments, consumers and the community at large. In determing their own strategies, it is important that private sector agencies should relate them to basic objectives of the enterprise,namely; profitability, growth and survival. These objectives can be appropriately linked to environmental education as follows:

For profitability:

1. This linkage can be made by prevention instead of correction of environmental problems;

2. By using more efficient low-waste technology;

Growth:

1. By technology development to use by-products, recycling wastes and adaptation of new processes;

Survival:

1. Better cooperation with government through observation of environmental laws which will promote goodwill and mutual consideration;

2. Improving community relations through participatory planning, will prevent costly environmental conflict.

In further support of these objectives, commercial interests might also support the following acitivities which are more directly related to education, the subject to which we are all committed:

1. promote environmental awareness among their members by training and information;

2. act as a clearing house for information on environmentally sound technology;

3. encourage technology development by cooperation between enterprises, local research institutions and support by government;

4. seek to be consulted in the drafting of environmental legislation and the modalities of its applications;

5. provide guidance to members on environmental law and practices;

6. inform the public, directly and through the media, on the positive actions undertaken and the results achieved; and

8. provide channels of communication with the public and special interest groups.

Having just reflected on those important objectives, which we expect the private sector in the region to support, I think it would now be useful for us to reflect briefly on the status of the Caribbean environment and the nature, history and perceived purpose of environmental education in our region.

The Caribbean region faces a number of common and severe environmental problems, which in general include: surface and ground water destruction and of wildlife and wildlife habitat, as well as the serious deficiencies in urban planning and the related management of the environment with respect to the infrastructure.

More specifically, surface water resources have been severly polluted by sewage and industrial wastes, and unplanned and uncoordinated development on the coastal plains have been largly responsible for the significant erosion of the beaches. At the same time, the extensive use of fertilizers and agrochemicals in general, coupled with the down-stream effect are destroying fish and other aquatic life through over-fertilization or direct poisoning.

Soil erosion, the altering of stream flows and flood patterns and the reduction in genetic diversity of both flora and fauna, have arisen from the indiscriminate clearing of the forests for urban development and agriculture.

In most of these instances of environment damage, the attributing cause has been the "human factor". The "human factor" in this context being ignorance and negligence. Some where along the line of action leading to environmental damages, are technical planners or managers, engineers, technicians,

foremen or workers who do not understand or possibly do not care what the effects of their activities might be. The parallel could be drawn to a bulldozer working through a rich archaelogical area with attendant disregard for conservation.

Turning to the nature of environmental education, it should be noted that tackling the problem of ignorance, or irresponsibility to environmental issues can only be appropriately addressed by providing the necessary knowledge for the interpretation of the complex phenomena which shape the environment. These must include those ethical, economic and aesthetic values which constitute objectives of environmental education.

In other words, Environmental Education, (EE), may be regarded as a permanent process in which individuals and the community at large, gain awareness of their environment and acquire the knowledge, values, skills, experience and also the determination which will enable them to act - individually or collectively, to solve present and future environmental problems.

Environmental Education must therefore address the values and motivations conducive to appropriate behaviour patterns and promote measures that are instrumental in preserving and improving the environment. To this end, EE must seek to clarify and harmonize the ethical, aesthetic and economic concerns and values of individuals and communities so far as these influence their perception of the environment.

For our own part here in Jamaica, the Country Environment Profile which examines EE, states that dissemination of EE can be effectively done via the formal or the nonformal methods. The nonformal system is comprised of a network that spans both the public and private sectors, and includes environmentally-oriented interest groups, such as clubs, government agencies, some industries and the church, to name a few. To those which have been involved, we offer our congratulations and appreciation. These organisations normally offer their education programmes through environmental themes, presented in workshops, exhibitions, posters, pamphlets, talk shows, radio and television programmes.

The formal system, on the other hand, is comprised of the school system at the primary, secondary and tertiary levels. EE, in this system, begins with the development of a general awareness of the physical world, followed by the introduction of environmental principles and their relationship to man.

Environmental Education in this context, should therefore not be seen as just one more of the subjects in the regular school curricula. Instead, it should be incorporated into the programme of all educational activities as far as possible, from

the non-specialist subject areas of young students, to the specialist professional student or trainee, who, in his working life, will significantly affect the environment by his/her activities. The foundations must therefore be laid in educational training. Planners, technologists, technicians and skilled workers will need this appreciation if they are to efficiently contribute to the management of the environment.

The graduates of technical and vocational schools from a significant percentage of the workforce which will directly or indirectly influence the socio-economic impact of developmental activities on the environment. Thus the teaching of environmental education in the technical and vocational school system is essential.

Recent studies have confirmed that over the past two decades, there has been a rapid emerging awareness of the role which education can play in the understanding, prevention and solution of environmental problems. It is generally known that the key to these problems lies to a large extent in social, economic and cultural factors and therefore cannot be prevented, or solved by purely technological or legal means. We will have to work primarily on the values, attitudes and behaviour of individuals and groups in order to direct them towards the environmental management concept.

It should be noted that the first major impetus for the formal acceptance of environmental education in developmental activities, arose from the 1982 United Nations Conference on the Human Environment in Stockholm, where concern for a generalized environmental education programme was raised and the decision taken to support it.

Recommendation 96 of this Conference called for the establishment of: "an education, interdisciplinary in approach, in school and out-of-school, encompassing all levels of education and directed towards the general public and in particular, the ordinary citizen living in the rural and urban areas, youth and adult alike, with a view to educating him as to simple steps he might take within his means to manage and control his environment."

Mr. Chairman, it is worth noting that the first intergovernmental conference on environmental education was held as eraly as 1977 at Tbilisi, in the USSR. The Tbilisi Conference made recommendations for the promotion and development of environmental education programmes by its member states.

Out of this, a number of Caribbean training programmes have been organized, the first being the Sub-regional Training Workshop on Environmental Education which was held in Antigua in June, 1980. This was followed by a Teacher Training Workshop in 1983, and today the opening of the third of these such programmes.

Mr. Chairman, if one might be allowed to share some critical comments with you, I would first like to state that there is a fundamental difference in the objectives of general environmental education and the type of educational studies that must be covered in the curricula for technical and vocational education. In the former, (that is a general environmental programme) the primary aim is to promote an awareness and understanding of the ecological principles and their relationship to human activities. In the technical and vocational education context, environmental education should aim at making students and trainees aware of the specific environmental problems and risks, including those relating to the safety and health of the working group. In addition, it should be noted that the type of industry or occupation which the students are prepared to enter, and assisting them in recognizing the potential environmental problems and how to prevent or control them. More specifically, it should seek to provide the theoretical and scientific basis of the technology which needs to be applied to cope with the actual and potential problems.

Any technical and/or vocational educational programme should normally be an integrated process, combining three distinct elements:

1. the study of science and technology, as it relates to a particular occupational field. Here, the aim is to create an understanding of the various processes and technologies applied within the field, the scientific principles applied and the nature of the technology used.

2. the development of skills in the handling of tools and equipment used within the occupational field, including as appropriate, the tools of research, development, design and control; and

3. the application of the theoretical knowledge and the practical skills in the operaitonal situation, with the objective of placing what is learnt in the classroom into a realistic perspective and, in particular, to gain experience of the special culture of organized production and people together.

Environmental Education, like all the other technical and vocational subjects, should be provided through all channels of learning.

Such a system will provide not only the opportunity for formal teaching, but in addition, provide the outlets for practical training. This is the key factor, as student need to learn to appreciate and understand the complex inter-relationship between technical activities and the environment.

It must therefore be our aim to ensure that students entering Technical and Vocational Institutions already have the exposure to the general concept of environmental education and be familiar with some technical concepts such as: ecosystems, energy flow in the various components of the earth's ecosystem, population dynamics and the major effects of human intervention in the natural processes.

However, if this basic foundation has not been laid or not properly done, time and effort will have to be devoted to the teaching of the fundamentals of environmental technology, during the first year in these institutions.

In whatsoever type or level of technical or vocational institution and regardless of the area of specialization of the student, a general course on environmental issues with particular reference to: waste management, air, water and soil composition and management, as well as environmental impact assessment must be included.

The course should aim to convey a sense of responsibility, at all levels, for the maintenance and improvement of the outer environment and to provide technical and theoretical knowledge of both polluting effects on the environment of careless waste disposal and the means existing to prevent them.

It should also deal with issues relating to the environment, conveying knowledge on basic engineering, safety principles, elements of industrial hygiene and knowledge of common health risks and prevention measures. Another important component should be the familiarization of students with the activities and norms of the various public authorities and private bodies concerned with general environmental issues, as well as industrial safety and health and the legal framework for environmental management.

Mr. Chairman, in conclusion, it could be said that as a result of the growing awareness and importance of environmental issues in the Caribbean society and the increasing risk of irreversible damage to the outer environment, as well as risks of major accidents and occipational diseases at the workplace, there is urgent need for a well-planned and executed education and training programme in the region.

I wish to repeat for emphasis that the objective of environmental education is to make individuals and communities understand the complex nature of the natural and built environment, resulting from the interaction of their biological, physical, economic and cultural impacts. As a result, environmental education must be applied to clearly demonstrate economic, political and ecological interdependence of the modern world of the workplace, the larger world of the nation and the region, and the wider world of international interdependence.

Environmental education in technical and vocational schools should therefore build on the basic environmental education programmes of earlier years, be reinforced, and broaden the awareness, knowledge and the skills acquired, to relate more exactly to the particular risk and management possibilities of the occupation concerned.

In order to achieve this, I call on the educational system of the region and the CXC Examinations Council to begin as a matter of urgency, not only to support technical and vocational environmental education development and function per se, but to develop a syllabus for environmental education at both the 'O' and 'A' level standards for high and technical schools.

Tertiary educational institution such as CAST and the College of Agriculture, in Jamaica, The John Donaldson Institute in Trinidad and Tobago and certain areas in the Teachers' Colleges, should also develop appropriate curricula in environmental education as soon as possible.

In closing, let me wish for you success in your deliberations, and remind you of the words of the eminent American philosopher and educator, John Dewey, at the closing of the UNEP, Belgrade seminar on Environmental Education in 1975 - "..... education is a preparation for life ..... education is life itself."

I thank you for sharing these thoughts with me and I now declare the Seminar open.

A.2.2 CLOSING SPEECHES

A.2.2.1 OPENING REMARKS

Chairman
Dr. A. Sangster
President, CAST

I am very pleased to welcome you all to the closing cermony of what has obviously been a very stimulating and productive workshop, I would particularly like to welcome Mr. Silvano Bricino of UNEP who is our guest speaker, Mr. Ghafoor Ghaznawi of UNESCO who has helped to keep out workshop going on track, other friends of CAST, and interested workers in the field of the environment.

I would like to congratulate the participants - the country representatives and the resource persons - for their hard work and participation in what had obviously been a very successful exercise.

I would like to thank also Mr. George Roper and the Science Department team for their hard work in getting the report, and particularly UNESCO for their ongoing support and to the representative from Paris, Dr. Ghaznawi, for his participation and assistance with the seminar. Special thanks too to Mr. Simon Clarke, the local UNESCO Regional Educational Advisor for his encouragement and support.

Ladies and Gentlemen, it is a trite but forever true statement that the proof of any pudding is the eating thereof, this is no less true in this event. The real benefits of the workshop will only be observed when the material which has been developed and the initiatives which can be put in place do become realities in our several Caribbean Territories.

Again I congratulate all who have had to do with the workshop and say how proud as a College we have been to have had it here at CAST.

Thank you again and a warm welcome to the closing exercise.

A.2.2.: **VOTE OF THANKS**

by Mr. Giles Romulus

Dr. Sangster, President of CAST
Dr. Ghaznawi, UNESCO Representative
Mr. Silvan Briceno, Representative Caribbean Environment Programme
Mr. Roper and Members of the Secretariat
Resource Persons, Distinguished coleagues
Ladies and Gentlemen.

I would like to preface this vote of thanks with a few pertinent remarks and observations. The history of mankind (homosapiens) has been one of dominance and dependence on nature.

If we were to use a 24 hour clock to represent the history of the earth, man perhaps only appeared at two minutes to midnight yet, ever since his appearance, his relationship with nature progressively changed from a subject of nature to that of the most dominant species as a result of his ingenuity and culture.

Through his inventive mind, man has simplified nature by imposing uniformity where there was complexity and variety. His laboratories have brewed chemicals of death. Indeed we (man) have assumed the position of judge, jury and policeman condemning that which sustains us.

Mr. Chairman, what bothers me and most of us is the reality that symptoms of our demise may occur long after we have sealed our fate.

With this in mind we are thankful to UNESCO - UNEP - IEEP and CAST for convening this seminar.

We have ended these eight days of deliberations more aware of our environment, more knowledgeable and certainly more sensitised. We have seen the dire need for Environmental Education (EE) at all levels in society and not only at the Technical and Vocational Levels. We have been baptized as disciples of EE, going forth to spread the good news and to help enlighten where there is ignorance and to motivate where there is apathy.

Mr. Chairman, our present state of mind and commitment would not have been attained without this initiative by UNESCO and CAST. We are therefore thankful to :

- UNESCO and its representative, Dr. Ghaznawi, for organising this seminar and allowing a forum through which persons from the region could articulate their views and produce strategies for the incorporation of EE in Industrial schools;

- Dr. Sangster, Mr. Roper, Mr. Saxena and our very charming and efficient coordinators in the persons of Mrs. Bedasse and Mrs. Hay-Webster. Our hats off to the committee.

- Our Resource Persons, Mr. Milton Pinnock, Mr. Telfer, Mr. Andres Oberli, Miss Mclennon, Dr, Joyce Glasgow and all others who helped, your inputs and expertise certainly guided us along the path of fruitful discussion.

- Our special thanks to the office staff, especially Mrs. Tomlinson for her warmth, persistence and kindness; our caterers and very importantly our Drivers. To all the organisers, facilitators and resource persons who helped to make this seminar a success, we express our deepest gratitude.

Mr. Chairman, eight days ago when we arrived we were greeted with promises that we would be put to work every minute of every day - perhaps this was not the best greeting. In retrospect, we can say that we have worked hard. We have enjoyed ourselves working hard and we have learnt much, every minute of every day.

We as a group of Caribbean Nationals are convinced that EE is the sine qua non Environmental Conservation. We therefore go forth to increase awareness, change attitudes and promote national discussion within our territories. This zeal is a product of foresight and a commitment by UNESCO for which we are indebted.

Dr. Ghaznawi, please convey our gratitude to your head office in Paris, and we hope to see continued work in the field of Environmental Education by UNESCO and UNEP in the future.

With the lessons of this seminar ibdelibly etched on our minds, let us make a commitment to meet for an evaluation in two years time. There is a caution, let us not be accused of being just persons who convene meetings to deliberate, write, produce thick documents and decide on the venue for the next meeting. Let us go forth as implementors for as Edmund Burke once said "the greatest mistake we can make is to do nothing because we can do little."

A.2.2.3 **Remarks by Seminar Coordinator**

Mr. George A. Roper
Head, Department of Science
C.A.S.T.

Mr. Chairman, Mr. Briceno, Dr. Ghaznawi
Participants, Resource Persons, Observers
Guests, Ladies and Gentlemen.

I also take pleasure in welcoming you to this closing session of the Seminar.

We have come to the end of a very exciting and interesting nine-day period in which participants, observers and resource persons from both within and outside the College have shared their experiences, thoughts and energies in addressing an issue of national, regional and international significance, the environment, the particular focus being the incorporation of EE into Industrial Education.

We had representatives from eight English-speaking Caribbean States, and the Republic of Cuba.

CAST contributors and resource persons were drawn from the Science, Engineering, Building and Technical Education Departments and these were supported by resource persons from the Faculty of Education, Department of Social and Preventive Medicine, University of the West Indies and from the Science, Technology and Research Division, Ministry of Agriculture.

The Department is indeed grateful to the College Council through our President Dr. Sangster for choosing the Department of Science as the host department for organising and delivering the seminar. We see this as another dimension towards furthering the promotion of environmental education both nationally and regionally.

The College is also grateful to UNESCO, for according it the honour of hosting this seminar.

The programme in the main was structured by UNESCO, under the direction of Dr. Ghaznawi, with the College providing the necessary logistics and resources for its delivery.

In order to effect efficient planning and organization for the seminar, several working committees were formed; namely, an organizing committee, which was mainly responsible for logistical planning for both the pre and in-seminar arrangements

and steering and drafting committees for in-seminar proceedings.

I would like to express my sincere thanks to the members of these three committees for their hard work and tireless effort in helping to ensure that things went smoothly during the pre-seminar planning stages as well as during the seminar itself.

Finally, on this aspect, the Department and College wish to express their sincere appreciation to Dr. Ghaznawi for his expert guidance and assistance during the seminar sessions as well as with the drafting requirements during the period.

It was for us and also the participants a new experience and a good example of team-work and cooperation.

My wish is that this continuing initiative by UNESCO and the proceedings of this seminar will further enhance and contribute towards the intended goal of imparting UNESCO-UNEP-IEEP objectives of environmental awareness, knowledge and attitudes within member states of the sub-region.

Finally, to you the participants and all those who have contributed over the past nine days by way of formal presentations or the sharing of ideas in plenary and group discussions, many thanks on behalf of the College.

For our overseas guests, we wish you a safe travel home. Last but not least, it would be remiss if I did not commend heartily all those persons who worked assiduously behind the scenes to ensure the success of this seminar.

I thank you.

A.2.2.4 **KEYNOTE ADDRESS**

Salvano Briceno
Representative
UNEP - Caribbean Environment Programme

Dr. Alfred Sangster, President of CAST,
Dr. Abdul Ghafoor Ghaznawi, UNESCO-Paris
Mr. George Roper, Seminar Co-ordinator
Participants of the Seminar,
Ladies and Gentlemen.

Our office has been requested to make some remarks before the official closing of this seminar. I am very happy to do so and would like to start congratulating you on the results of last week's hard work. The draft report has just been discussed and presents a number of guidelines which will help all actors in the field of industrial environmetnal education.

It is appropriate at a moment like this to reflect on what is to be done next, how the results of your work, how your ideas and guidelines can add most effectively to the incorporation of environmental education in the curriculum of industrial schools in the Caribbean region. An important issue for this is the dissemination of the information of this seminar to a wide variety of people, the teachers, the decision-makers but certainly also the public at large. Besides this we have the duty to overcome the hurdles which hamper the implementation in some form, to stimulate action as soon as possible.

The Caribbean Environment Programme provides a forum to reflect what has to be done and a framework for priority action-oriented projects. I will come back on the environmental education projects being implemented within the Programme. But before turning to this, I would like to dwell for a moment on the nature of environmental education. I speak with the confidence that, in this gathering, we share many common assumptions and values and have a strong commitment to education.

The present is a timely moment for reflection and action. I would like to quote some thoughts by various authors. Let me begin with John Smyth, who reminds us that "education is defined by the Oxford English Dictionary as the process of preparing people for the work of life. Since this work can only be performed in an environment of some sort, it is reasonable to inquire why education should ever need to be distinguished as 'environmental'".

As another important author, Mark Barham states when defining the ecology of education, "from this standpoint nature is not

just something 'out-there' in the form of fields, forests, clouds and stars, but it is also 'here', and each one of us is a part of nature as well. All that we do is subject to what we understand are its principles, those that are known, and undoubtly those that are unknown as well.

"With all due respect to green politicians, green economists and Greenpeace, ecology is far more than saving trees, rabbits, dolphins, sites of scenic beauty, and humans from the ravages of monetarists, vivisectionists, equatic zoo-keepers, motorway enthusiasts, power station advocates, and nuclear-weapon testers.

"Ecology is nothing less than the study of organizational reciprocity because every form of life, including our own, is an organization in some phase of development or decay, in constant interchange with its internal and external environment."

When we apply these thoughts in an international cadre, statistics tell us that poverty in developing countries is increasing. There are perhaps 1,5 billion people for whom the basic needs of health, food, shelter, education, do not exist, who live often in situations of environmental degradation, in rural wastelands and city slums. Much of the reason for this sad state is that both the arms race and the political conflicts depleate vitally needed resources, human and material.

Teilhard de Chardin reminds us however, that "the outcome of the world, the gates of the future, the entry into the super-human - these are not thrown open to a few of the privileged, not to one chosen people to the exclusion of all others. They will be open to an advance of all together, in a direction in which all together can join and find completion in a spiritual renovation of the earth...".

The education system often has simply not provided either materials or media to explain, circumvent or pervent the problems or to provide solutions.

The tragedy in all this is that never before in human history so much knowledge has been accumulated, and even if ill-digested, it provides some solutions to the major socio-economic environmental questions. Additionally, the mechanisms for storing and diffusing this information are readily and relatively cheaply available through computerisation.

The Caribbean Environment Programme is providing a unique opportunity for regional co-operation. After years if consultation and negotation, the thirty-three states and territories of the Wider Caribbean Region have joined in pursuit

of a common goal - protection balanced and sustainable economic development. The Programme represents an expression of goals and an Aciton Plan, adopted by the participating governments.

Two major legal instruments have been adopted and entered into force. The Convention for the Protection and Development of the Marine Environment in the Wider Caribbean Region; and the Protocol Concerning Co-operation in Combating Oil Spills in the Wider Caribbean Region.

More than one year ago, the Regional Co-ordinating Unit was established to provide the co-ordination of the Programme. This Unit is based on downtown Kingston, in the Government Conference Centre.

More than ten projects were already completed and currently, there are twenty-eight specific projects underway. Environmental Education and Training has been accorded continuously with the highest priority in the Programme. One project, "Development of Environmental Education and Public Awareness on Marine and Coastal Resource Management in the Wider Caribbean Region" started in 1982, and is implemented by the Caribbean Conservation Association, the CCA. this organization, based in Barbados, has developed radio programmes focussing on Caribbean environmental issues, promoted the establishment of an informal network of media personnel, and compiled a regional directory of environmental education institutions, resources and people.

Now that the Caribbean Environment Programme is being managed out of the Region, our next phase is to support a greater involvement of CCA in planning the changes needed in educational systems. This will focus on curriculum development, teachers training and production of materials. Among the tasks to be undertaken in this plan is the development of regional and national resource centres for environmental education, training and public awareness. these centres will then promote and stimulate the actions required for tackling the problems as highlighted before.

This project also includes the strengthening of CCA as a regional resource centre on environmental education, through the establishment of data bases, and as their main outputs dissemination of newsletters, directories, outreach packs for teachers and other information.

There a a number of other activities that our Programme is supporting as part of its involvement in training, education and public awareness. One project is conducted by UNEP's Environmental Training Network (MECORED) out of the Regional Office of UNEP in Mexico. this project identifies the Region's

training facilities and training needs for the management of development projects, in particular in the areas of marine pollution and environmental health.

Recently was established, a consortium of Caribbean Universities for natural resources management, by the Association of Caribbean Universities, UNICA. The Caribbean Environment Programme is in the process of developing a joint programme, which aims to enhance and develop the capacity of Caribbean institutions to provide practical education and training in natural resource management that is relevant to the region's natural and institutional context, especially that of smaller islands.

The Centre for Resource Management and Environmental Studies, CERMES, which is affilitated to the Cave Hill Campus of the University of the West Indie s in Barbados, plans to conduct a project on education and training in industrial pollution control. This is of particular interest in the scope of this seminar. The project envisages to assist the islands of the Wider Caribbean in their industrial development activities and policies. this through the development and application of environmental criteria for industrial siting and legislative guidelines for emissions and effluents standards; and the development of appropriate institutional infrastructure.

Ladies and Gentlemen,

I hope that this overview of the Caribbean Environment Programme and the environmental training, education and public awareness projects illustrates that this Programme continuously tries to integrate environmental education as a basic part of the management of the natural resources and the environment.

In order to get our message known in the region and listen to, we are promoting through our projects the development of creative strategies, which are geared towards among others the students at industrial schools, whose participation in building a sustainable Caribbean society is very much needed.

You will build on the experiences as gained in this seminar. and we will too. You and I know that our work is not finished, that it is only starting. Your further input in the projects as I mentioned before is highly appreciated.

And I wish you all a safe travel home.

A.2.2.5 **CLOSING STATEMENT**

Dr. Abdul Ghafoor Ghaznawi
UNESCO, Paris

Dr. Sangster,
Mr. Briceno,
Mr. Roper,
Ladies and Gentlemen

This was been a one-week training seminar of intensive plenary sessions and group work to study the place and need of environmental education (EE) in technical and vocational education (TVE), to develop strategies for the incorporation of EE into curriculum and teacher training of industrial schools, to develop prototype EE materials, to enhance exchange of information and experience and to identify documents and activities to be developed by IEEP.

Before I elaborate the achieved work of the seminar, I would like to emphasize, as I did in the opening session, that environmental education is a very forceful tool in educational renewal. EE fosters interdisciplinarity which helps erasing the artificial compartmentalization of the different subjects and their teaching/learning especially in theearly stages of education when the child's image of the environment is naturally holistic and not compartmentalized.

EE relates to the individual and society and this facilitates teaching and learning in different levels and types of education. For example, if a child or an adult is told that something in the environment is affecting him positively or negatively, he becomes interested and curious to know it and know more about it and to find out what to do about it. In situations like this most people may learn easier and faster.

EE advocates problem-solving approach which, if developed properly, can help the individual in the easy identification, solution and prevention of environmental problems which are on the increase and change. The skills of problem-solving has a daily life-long utility in different domains.

EE advocates life-long attitudes, commitments, and actions concerning the improvement of the environment. Thus, EE is a relevant and useful life-long education.

EE identifies and introduces the environment as a broad and concrete context in which all types of curriculum change are possible. This can include the change of an over-crowded curricula into an operational one through combination of certain subjects.

The above and other similar attributes of EE make it a dynamic seed of educational renewal.

I believe it is time to take advantage of this contribution of EE and have it incorporated into all types and levels of education.

A fundamental strategy for achieving the above task is to make room for EE and its objectives in the national educational objectives, policies and plans which would serve as a mandate for all educational institutions to take necessary actions for the incorporation of EE into the full spectrum of education in a nation.

In the Caribbean context I believe in the urgency expressed and the call made by Dr. H. Lowe at the opening session of this seminar "on the education system of the region and the CXC Examination Council to begin as a matter of urgency, not only to support technical vocational EE development and function per se, but to develop a syllabus for EE at both 'O' and 'A' level standards for high and technical schools ... Tertiary education institutions such as CAST and the College of Agriculture in Jamaica; the Donaldson Institute in Trinidad and Tobago and certain areas in the Teacher's Colleges, should also develop appropriate curricula in EE as soon as possible".

The news issued on 12th May 1988 by the Faculty of Natural Sciences of the University of the West Indies (UWI) is very encouraging because of their decision to offer "Environmental Science Degree" as of October 1988. It is a major step forward towards meeting human resource needs of the region in environmental matters. Furthermore, it is my hope that some of the environmental science courses for the above Degree could be shared with the students of the Faculty of Education at UWI for furthering EE in teacher training which will have direct impact on the school systems.

I should like to remind the coordinator of this seminar, Mr. George Roper, Head of Science Department of CAST that his envisaged plan of submitting a proposal for approval to the Board of CAST on offering an interdisciplinary EE course for the first or second year students at CAST is very timely and needed. My recommendation in this case is to take action as quickly as possible.

Ladies and Gentlemen

The objectives of this seminar were achieved through the presentation and discussion of UNESCO documents entitled (i) Environmental Education in Technical and Vocational Education; (ii) Strategies for the Incorporation of Environmental Education into the Curriculum and Teacger Training for Industrial Schools; (iii) Three case studies from Jamaica, Singapore, and Czechoslovakia; presentation and discussion of nine country reports and preparation of two EE modules based on problem-solving approach and seven modules for industrial schools.

These modules as the concrete output of the seminar are significant because they are based on the identified environmental problems of the participating member States. These problems on the regional basis were identified as "deforestation, solid and liquid waste management, pollution, coastal zone management, wildlife and habitat extinction, urbanization and development".

The relevance of these modules to the environmental problems of the region makes their local adaptation more relevant and convenient and I hope that the participants of the seminar, as key educational personnel, take appropriate action in this context.

Mr. Chairman,

I am very much appreciative of the keen interest and hard work of the prrticipants in the seminar. This was demonstrated by the preparation and presentation of country reports. Their attendance was excellent. They regularly worked two or three hours each day beyond the scheduled closing hours. Furthermore, the desire and action of the participants to improve the quality of the output of the seminar was evident in their efforts to revise and improve their respective modules and this is indeed appreciated.

CAST provided several resource persons who presented and discussed the working documents. They also prepared resumes of these documents. Some of them participated and contributed in the working groups. Dr. Glasgow and Mr. Pinnock further helped in the editing of the draft final report. I want to thank them all very sincerly.

Dr. Sangster
Ladies and Gentlemen,

This has indeed been a busy week for Mr. George Roper, Head, Science Department of CAST and coordinator of the seminar, for some of the staff members and a team of support personnel from CAST. As I mentioned earlier the sessions of the seminar went much beyond the scheduled hours. The sessions were often extended to about 7:00 p.m. which were followed by the Steering Committee meeting under the chairmanship of Dr. Sangster for another hour. Beyond that it was the Drafting Committee and the support personnel that were engaged to process the work of the day. Their work was extended to mid-night on Friday, Saturday and to 3:00 a.m. on Sunday and it is because of that, that we have the full report ready for study and examination now. There was a successful team-work and cooperation under the guidance of Mr. Roper throughtout the seminar. I want to congratulate all of them. My thanks go to all of the members of the task-force of the seminar for their patience and hard and productive work done on time and with quality.

Dr. Sangster,

I want to thank you and your Department of Science for hosting this seminar on the beautiful campus of CAST, the facilities and services provided for the seminar were excellent. Your guidance of the Steering Committee is most appreciated by all of us. I want to thank you for the Jamaican hospitality during the seminar.

I would like to add that although this was my first collaboration with CAST, I found the team that I worked with so cooperative, kind and friendly, that I felt I had been working as a staff member of CAST for many years.

With these warm feelings of cooperation, and looking forward to future collaboration with education institutions in the development of environmental education in the Caribbean, I declare this Sub-regional Training Seminar closed.

Thank you.

A.3 - **LIST OF DOCUMENTS**

3.1 Environmental Education in Technical and Vocational Education, UNESCO (EE24).

3.2 Strategies for the Incorporation of Environmental Education in the Curriculum and Teacher Training for Industrial Schools, UNESCO.

3.3 Case Study on the Incorporation of Environmental Education into the Curriculum and Teacher Training of Technical Schools in Singapore, UNESCO.

3.4 Case Study on the Incorporation of Environmental Education in the School Curriculum and Teacher Training of Technical Schools in Czechoslovakia, UNESCO.

3.5 Case Study on the Incorporation of Environmental Education in the School Curriculum and Teacher Training of Technical Schools in Jamaica, UNESCO.

A.4 LIST OF PARTICIPANTS

ANTIGUA

Mr. Eustace Hill
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Mr. Kent Dennie
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CAST RESOURCE PERSONS

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UNESCO

Dr. Abdul Ghafoor Ghaznawi
Programme Specialist
Environmental Education Section
Division of Science, Technical & Environmental Education
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OBSERVERS

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Mr. Van Hitchener
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Ms. Sylvia Thomas
Secretary General
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Lt. Commander John McFarlene
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Mr. Patrick Cameron
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Miss Joy Douglas
National Conservation & Development Trust
Kingston, Jamaica.

Miss Christine Mullings
National Conservation Development Trust
Kingston, Jamaica.

A.5 ORGANIZING COMMITTEE

The Organizing Committee of the Seminar consisted of the following Personnel :

Chairman	:	Dr. Alfred Sangster
Seminar Co-ordinator	:	Mr. George A. Roper
Members	:	Mr. Yogen K. Saxena
		Ms. Janet Bedasse,
		Ms. Sharon Hay-Webster
		Mr. Milton A. Pinnock

A.6 REPORT ON SLIDE PRESENTATION AND FIELD TRIP

As part of the seminar, a slide presentation and field trip was organized by CAST; both activities highlighting important aspects of environmental mismanagement and associated problems; in the Kingston and St. Andrew area.

(A) Slide Presentation

The slide presentation whose theme was Environmental Problems in Jamaica and Solutions, was delivered by Mr. Andreas Oberli and focussed primarily on the problems of deforestation. He pointed out that although the problem of deforestation became acute over the last 10 to 13 years, there were evidences of its existence as far back as in the 18th and 19th centuries.

Slides

The slides presented were arranged into three groups, namely: (1) Scenic areas of the Blue Mountains (2) Problems associated with the environment and (3) Solutions for these problems.

Group 1

This set of slides depicted areas in the Blue Mountains in their natural state as well as their scenic beauty.

Group 2

The second set of slides focussed on the problems and effects resultant on indiscriminate land use activity and mismanagement.

Problems highlighted were

(1) Removal of Forest through slashing/burning and destruction of trees. This resulted in soil erosion leaving large areas of exposed rocks and soil being washed away into rivers.

(2) Destruction of Coral Reefs by
   (a) Sedimentation as a result of deforestation and soil erosion
   (b) pollutiion
   (c) hurricanes.

It was noted that where as man-made activities could completely destroy coral reefs, destruction by hurricanes usually resulted in complete recovery within 4 to 5 years.

(3) Forest Fires were usually man-made and did great damage to the cultivated pine forests as well as endemic flora and fauna.
The ultimate consequence was usually extreme soil erosion.

(4) Kingston Harbour the building of the Causeway across the Kingston Harbour prevented free circulation of sea water, leading to destruction of reefs, and mangrove swamps as well as general pollution. This has severely affected the fish and shrimp population of the harbour.

(5) Coffee Plantations commercial coffee plantations in the Blue Mountains have also resulted in the destruction of large acerages of plant life and have upset the ecological balance in the area. The use of pesticides have also affected the local fauna and in many instances pesticide residues find their way into the surrounding river system.

Group 3

Solutions

The following solutions were proposed as possible strategies for combating some of the problems highlighted in the presentation.

- protection of the inherited Botanic Gardens
- identification of species of flora and fauna
- production of booklets
- protection of indigenous species
- on-the-job training
- fire fighting techniques
- establishment of nurseries
- plant-a-tree program

(B) **Field Trip**

After the Slide Presentation participants were taken on a field trip to locations in the Blue Mountains situated at approximately 4000 ft. above sea level.

The choice of the areas was specially significant to participants as it enabled them to get a first-hand view of the destructive consequences of deforestation and its associated problems.

It was observed quite vividly that several areas which were once forest and prime watershed areas have been deforested and are now commercial coffee plantations.

Evidence of forest fires and the exposure of top soil to the destructive forces of the weather were seen. Problems of erosion, siltation and river/stream pollution due to waste from coffee factories were also observed.

It was clear from the responses of the participants that the visit was rewarding, as it gave them the opportunity to exchange views on environmental problems, as well as to understand and appreciate the potential seriousness of these and other environmental problems faced in their respective countries.

APPENDIX 7 - RESUMES OF WORKING DOCUMENTS

A.7.1 Environmental Education in Technical and Vocational Education (EE.24)

A.7.2 Strategies for the Incorporation of Environmental Education in Industrial Schools

A.7.3 Case Study on the Incorporation of Environmental Education in Industrial Schools in Singapore

A.7.4 Case Study on the Incorporation of Environmental Education in Industrial Schools in Czechoslovakia

A.7.5 Case Study on the Incorporation of Environmental Education in Industrial Schools in Jamaica.

7.1 ENVIRONMENTAL EDUCATION IN TECHNICAL AND VOCATIONAL EDUCATION UNESCO (EE 24)

Summarized by Dr. Joyce Glasgow

7.1.1 INTRODUCTION

The aim of the paper is to give a general overview of environmental education (EE) specifically as it relates to technical and vocational education (TVE) and to suggest general principles for integrating EE into TVE.

The work is presented in six main sections, each addressing one of the following:-

- the main reasons for including environmental education (EE) in technical and vocational education (TVE);
- the environmental issues relevant to TVE;
- the envronmental risks which relate to the various levels and sectors of TVE;
- the integration of EE into TVE curricula;
- problems of teacher training for EE in TVE;
- a summary highlighting the principal aspects and problems.

Damage to the environment resulting from a wide range of technological applications is evident. Forests are dying, water has been polluted, industrial accidents recur, new materials and equipment used without proper care, damage to human and other life. Generally, the 'human factor' is blamed for the accidents and destructive side effects of various activities. This 'human factor' can be translated into 'ignorance and negligence'. The principal objectives of EE in TVE are, therefore:-

- to combat ignorance on environmental issues;
- to provide people with the knowledge and skills needed for dealing with these issues;
- to convey the sense of responsibility necessary for the proper application of these knowledge and skills.

The particular importance of attaining these objectives in TVE lies in the fact that technical personnel - engineers, technicians, foremen, and workers - are the essential human factors. They play the key roles in eliminating or reducing the negative Enviromental effects of the work they do. The graduates of the systems of TVE actively participate in the development and production processes which influence the human environment, as well as being themselves directly affected by that environment.

EE in TVE is made more difficult because of the wide range of tasks involved - the problems pertaining to mining differ from those of agriculture, or transport, for example. There has, therefore, to be specificity of attention to each area. Rapidly changing technology also makes it imperative that, all who are presently engaged in technical positions need to have ongoing training to enable them to deal with new materials and processes safely.

Complicating the situation still further is the broad range of public and private bodies involved in its administration, and the wide variety of forms in which TVE is provided. Broadly speaking, these forms may be summarised as under:

FORMS	**ADMINISTRATION**
In the formal system:	
- higher technical education	: University
- intermediate, technician level	: Special post-secondary institutions : Part of the secondary system
- lower, vocational level	: Part of the secondary system : Separate system of further education

FORMS	**ADMINISTRATION**
In the non-formal system:	
- adult training systems, concerned with specific technological applications or individual functions, e.g. management, extension services	: Public authorities : Research institutions : Specialised consultants : training institutes : operating enterprises
- on-the-job training	: picked up **ad hoc**

It is important to remember that a good proportion of the technical personnel involved in agriculture (including independent farmers), and in various fields of industry do, in fact, fall into the last category listed above. They "pick up" their knowledge and skills very informally on the job.

7.1.2 ENVIRONMENTAL ISSUES AND RISKS

Special needs of the TVE target population

Technical personnel need to have a background of general EE since they are exposed to general environmental risks in the same way as other people. TVE needs, however, to go beyond general EE. Technical personnel in their training need to learn how to identify and evaluate:

a) the effects of their professional work on the environment;

b) the risks to nature at large involved in the types of operations they perform;

c) the environmental properties of the raw materials they are using; the processes they are designing or controlling;

d) the risks involved in carrying out the processes in (c), both to those performing them, and to other human beings, as well as the consequences for the flora, fauna, soil, air, water in the immediate as well as further neighbourhoods.

The 'outer' and 'inner' environments

A distinction between an 'outer' environment, meaning the 'world around' and an 'inner' environment as the 'workplace' in which technical personnel are employed is useful in delineating the risks and issues involved. The two environments often, understandably, overlap - for example, what began as an accident related to the inner environment at Bhopal, soon became a catastrophe for thousands of human beings and other life down-wind from the plant as the poisonous gas killed or injured in the outer environment.

Issues and risks related to the outer environment

These concern the impact on the quality of life on earth by the particular type of activity. Important aspects are:

- the effect of **emissions** from productive units carried through air or water with human beings, other animals and plants at the other end - in short, air and water pollution;

- the properties of **products**, especially chemical products, any specific health or safety risks associated with their use, as well as their general effect on the environment;

- the consequences of **exploitation** of natural resources.

Emissions

The adverse results of these have varying manifestations.

a) Emissions may directly affect the environment, e.g. gases from coal and oil-burning furnaces; sulphuric elements, dust particles, soot from combustion processes entering the atmosphere.

b) Emissions may enter drainage channels, waterways, lakes, e.g. fibre from textile factories, spillwater from chemical and pharmaceutical factories; organic materials from farms and slaughterhouses, and result directly in the death of aquatic organisms.

c) Transformation of emissions may take place, e.g. the formation of sulphuric acid from sulphur oxides concentrated in the clouds, and resulting in acid rain which may fall a great distance away from the original emissions, to the detriment of wild life, buildings, etc.

d) Accumulation of toxic substances over time, e.g. heavy metals in the liver of animals, can cause disease or death.

e) Accumulation of poisons may also take place up food chains. Small animals like mice may absorb toxic chemicals from the environment, concentrate them within their bodies, which may then be eaten by larger animals. This process has been responsible for the declining numbers of many species of wild birds.

f) Over-fertilisation of waterways and lakes from seepage of natural and artificial fertilisers causes the over-production of algae. This in turn upsets the ecological balance, causing the death of fish and other aquatic organisms through insufficient oxygen.

g) Slag heaps and other evidence of mining may be left untreated.

Properties of products

Examples of problems connected with these are:

a) Health risks accompanying the handling of asbestos;

b) Gas emissions which may result from improper insulation and ventilation, favouring the growth of moulds;

c) The construction of toys which may endanger the health or life of children.

Exploitation of natural resources

Some examples are:

a) the selective felling of trees in natural forests, resulting in the loss of valuable species and secondary bush growth;

b) clearing of forest land for building or agriculture, resulting in soil erosion and fast run-off of rain water;

c) the undermining of land or sea bottoms by the extraction of gas.

It is not enough for EE in TVE to identify these problems. The content should cover the 'what', the 'why' and the 'how'. Therefore, in each particular field, students should know:

a) the elements within the field that may have an impact on the outer environment; put people, flora and fauna at risk if the process gets out of control, or if wastes are dispersed indiscriminately;

b) what can and should be done to eliminate the risk factors or to keep them within permissible limits - and **how** this is done;

c) how to estimate the risks, and calculate costs and benefits (including long-term environmental cost) of eliminating them.

Issues and risks relating to the environment

The risks found in the inner environment fall under four main headings.

Organizational risks: These relate to the organization of the work process and the order kept at the workplace. They include:

a) transportation of raw materials and products through the workshop, and ground transport;

b) the procedures for the initial safety instruction of new employees;

c) the distribution of responsibility for maintenance and repair of equipment, and thestorage of inflammable and other dangerous materials;

d) the supervision of the application of safety rules and other instructional requirements, including emergency action in cases of accidents or fire.

Equipment-related risks: These are primarily concerned with the safety and health of the individual and include:

a) measures to be taken or maintained to avoid being maimed by equipment, e.g. by wounding, excessive noise;

b) protective measures against impairment by extreme heat or cold, and against radiation;

c) maintenance of proper posture in the workplace.

Process-related risks: These concern the safe handling of raw materials and products. Included are:

a) the handling of carcinogenic materials, or those which may cause damage to the skin, eyes, lungs or other organs;

b) the danger to self and others during welding operations - eye damage, risk of fire;

c) risks related to the evaporation of solvents and inflammable substances, the proper use of explosive materials including storage of gas tubes.

Product-related risks: These relate to communications from the producer to the client, and include:

a) the precautions which should be taken by the users of the product. Proper instructions for use should be formulated by the producer, and extra-mural services offered as part of sales or after-sales service;

b) the maintenance of ongoing contact between the producers, for example, of artificial fertilisers, weed killers, pesticides on the one hand, and agricultural training institutions on the other.

Many of these risks are straightforward cause and effect connections between an environmental factor and a particular kind of accident. Data on these safety hazards and occupational health risks, as well as information on measures for eliminating or reducing these risk factors in the working environment, are recorded on an international scale. They are published by the International Labour Office in Geneva, which also runs a computer-assisted data bank service available to interested persons.

The urgency of the issues: There is no question of grading the various environmental issues that need to be taken into account in EE in TVE according to level of urgency or severity of effects on society. **They are all urgent**, and differ only in their greater or lesser relevance to a particular occupational specialisation. What is important is that technical staff should be aware of the relationships between their particular field of activity and the environment; understand the environmental risks involved in it; acquire the skills, knowledge and attitudes to deal with these risks in an environmentally sound manner realise that constant technological change requires that they constantly update their knowledge.

7.1.3 TECHNICAL AND VOCATIONAL EDUCATION SYSTEMS

One of the main difficulties contributing to the design of programmes of EE for TVE is the complexity of TVE systems. They are complex by virtue of -

- the range of technological application they cover;
- the many levels at which TVE is provided;
- the variety of functions of personnel to be trained in adult education schemes;
- the numerous public and private bodies involved in their administration (see 7.1.1).

General characteristics of levels of TVE.

Higher technical education: The training of graduate engineers has been institutionalised in most countries and practices are fairly homogenous. Qualifications for entry are mostly through graduation from science streams in secondary schools. Studies are primarily theoretical with a complement of laboratory type activities, and in some countries, work in training workshops attached to the institution.

Intermediate levels of technical education: These levels train technicians, and arrangements are less homogenous than at the higher technical level.

a) Some countries distinguish between 'higher' and 'lower' technicians with different arrangements for their initial technical education.

b) Secondary technical schools and colleges of further education are the usual training institutions.

c) Present trends indicate a shift from (b) either:

- to move intermediate technical education to post-secondary institutions; or

- to create a higher level of intermediate technical education either by prolonging the technical streams in secondary education, or inserting a new form of technical education between secondary and higher technical education.

Studies at the intermediate level are more practically oriented than at the higher technical level. Some systems require completed apprenticeship or vocational education for entry. Variations exist as to the quantum of work experience involved; in countries where the industrial capacity cannot accommodate large numbers of technician trainees, emphasis is usually placed on institution-annexed workshops.

Lower technical and vocational education: This level caters to the training of skilled workers. Several variations of arrangements exist:

a) Traditional apprenticeship based on day or block release schedules. This involves shared responsibility between schools of further education on the one hand, and industrial enterprises, banks, etc., which provide the essential practical instruction and work experience in this dual system.

b) Presently evolving dual apprenticeship systems showing several trends, towards, for example -

- devoting more time to classroom instruction;
- transferring initiation into a particular field of work from the enterprises to the schools;
- leaving less time to on-the-job instruction and work experience;
- reducing training periods (to accommodate the higher age of intake necessitated by the prolongation of compulsory schooling).

c) Informal apprenticeship systems run on entirely traditional lines, without the support of TVE as in the dual systems in (a) and (b) above. This type of training still plays a major role in the informal parts of the economies of developing countries, although it is seldom officially recognised.

d) Special relationships between factories and collective forms on the one hand, and technical and vocational schools on the other. Students in vocational education spend varying periods on-the-job in the factory or farm, which also supplies part-time instructors to the schools. Students in technical education carry out their examination research and studies in the factories or on the farms.

Implications of these trends for EE in TVE.

a) They facilitate the process because increasing institutionalisation of the education process makes it easier to develop environmental elements in the subjects taught in related general and technical education.

b) They complicate the process in that the wider distribution of responsibility for practical training necessitates contact with all those involved in such training in order to ensure the interests of EE.

EE at different levels of TVE

The degree of specialisation and the great differences in subject matter taught in the various streams of TVE affect the the design of EE in TVE.

Higher technical education: At this level, technical education is concerned with broadly defined occupational areas; for example, mechanical engineering, or architecture. The content of EE programmes could be designed along similar lines for most specialisations with special emphasis on those problems directly related to individual technical subjects as necessary.

Intermediate and lower technical and vocational education

Specialisation is more pronounced and needs to be taken into account at these levels. Technicians are divided among a wider range of streams than students in higher technical education, and at the lower TVE level, specialisation is very high. In some industrial countries the 'apprenticeable occupations' may be as many as 350 to 700, and some systems of vocational education cater for as many as 100 skilled occupations, though a majority of students may be in only 30 of them. Here again, although EE needs are similar in broad groups of specialisations, the particular requirements for each separate specialisation have to be addressed.

TVE for adults: Satisfying EE needs in adult TVE is even more complex because of the variety and specificity of such training and the wider distribution of responsibility. In this situation, the search has to be for channels which might offer special opportunities for the diffusion of EE. These channels include:

a) **Adult training and retraining systems** normally operating under the aegis of labour market authorities, or by them jointly with educational authorities. These systems were primarily designed to improve the employability of workers by providing short-term training in very specific skills, but in many countries have gradually broadened their scope to include longer term TVE and a wider age range of participant. Where this is so, some of the more general EE relevant to students in secondary TVE institutions will need to be provided, in addition to that pertaining to the specific skills.

b) **Extension services** for agriculture and small industry.

Agricultural extension services are particularly important in EE, but in both agriculture and small industry, it is essential to cater to both younger and older employees in the occupations concerned to ensure the application of EE principles and practice.

c) **Services offered by private and public enterprise:**

- Large private enterprises are often the centres of economic and technical change, and serve concomitantly as pioneers in the use of new work methods. Training and development have become formalised, making it easier to reach these enterprises with a message. In addition, training and development and educational officers in commerce and industry often form associations for discussion and exchange of ideas, an arrangement which further facilitates the input of EE.

- Organisations such as Chambers of Industry, Federations of Agricultural Cooperatives with membership from private and public enterprise participate at national levels in the design and development of educational programmes related to their fields. Some offer consultancy services, and some have their own educational establishments through which EE may be channeled.

- Research institutions, consultant firms, management or productivity institutions constitutes another, but perhaps more elusive, channel for EE in TVE. These bodies keep abreast of various adult TVE activities with a view to advertising the quality and usefulness of their services.

7.1.4 PLANNING ENVIRONMENTAL EDUCATION FOR TECHNICAL AND VOCATIONAL EDUCATION

Considerations of environmental issues and risks, as well as the systems through which TVE is provided, suggest certain factors that should be borne in mind in planning EE for TVE:

a) EE in TVE should reinforce general EE that should have preceded it, or make up for its lack;

b) In TVE the principal subjects in EE are directly related to the occupational area in which students may be employed on graduation;

c) The content and form of EE differ with the level of TVE;

d) EE should be a life-long process for technical personnel;

e) EE in TVE should be provided through a multiplicity of channels, formal and informal.

In considering the general parameters for including EE in TVE, the functions of the EE will first be examined, then the necessary content.

Functions of EE in TVE.

General - initial - EE

Entry qualifications into higher technical education allow for the assumption that students are familiar with general EE principles. Nonetheless, by the end of the first year of study, if not at entry, the attitudes to, and knowledge and understanding of, environmental issues should be tested by the institutions. Results should be fed back into the secondary system with a view to making such improvements as would ensure a sound foundation for EE at the higher level.

At the intermediate and particularly the lower levels of TVE, no such assumptions can be made. Students are likely to have done less science, and to have been less exposed to general EE messages. It will be necessary to integrate into TVE curricula what has not been done in school. Here again, testing of applications with regard to their knowledge of environmental problems, especially those concerned with the field of their choice, and their understanding of the inter-relationships between different environmental factors, is necessary early in training. Training should reinforce whatever exposure there has been, and further develop skills for identifying, anticipating and solving environmental problems. It should also aim at students' direct participation in working towards solutions of environmental problems in their own societies.

Occupation-oriented - initial - EE

As pointed out before, this type of EE differs in focus from general EE. The primary aim is to provide the awareness, knowledge and skills required for individual and collective work in solving the acute environmental problems associated with particular occupational fields, and to prevent new problems arising in the outer or inner environments as a result of technological or economic change in activities pertaining to these occupations.

While the technology to be covered will differ with fields and levels of study, the following may be regarded as the basic objectives for ongoing EE in this context. Such EE should create an awareness and provide the required technological/economic skills for dealing with the environmental problems relating to:

a) the principal **products** of the field of activity concerned; the possible elimination of such problems and the principal technical solutions to them;

b) carrying out the **production processes** current in the particular field, including:

- recycling or direct use of process by-products;
- waste · disposal techniques, e.g. separation technology applying to polluting materials in the air, water and solid materials; storage, destruction or transformation of toxic waste;
- the safety and health of those involved in the **work process**, including the elimination of environmental risks, protection of those concerned and the maintenance of proper safety measures.

It should be added that total elimination of risk is what is desirable; protective measures are a recourse when such elimination is not possible. As well, the economic aspects of EE in TVE must be seen not only at the micro-level of the concerns regarding processes and products, but on a wider macro-economic scale, and must also take into account non-economic factors. The major environmental problems today are often international in character. They are macro and socio-economic in their effects on the quality of all life. They involve damage which cannot be expressed in economic terms, e.g. loss of species, and often irreversible aesthetic damage to the environment. These macro- and non-economic factors must also be taken into account at the workplace.

Adult - further - EE

Three considerations are particularly important in planning for adult EE in TVE, viz:

- new demands of fast-moving technology necessitate constant updating;
- correlation between what older generations of technical personnel know and what trainees presently in TVE are learning is necessary to maintain harmony in the workplace;
- older technical personnel may need not just updating, but complete retraining where their initial training had no EE components.

Prime target groups for further EE for adults include managers and supervisors at all levels; specialists in research and development, maintenance personnel; tank storage personnel; transport workers; inspectors, etc. Self-evident targets - and channels - for such training are personnel development officers, safety engineers and safety representatives of workers' unions.

EE content in TVE

EE in initial TVE

Where TVE is institutionalised, the principal choices in planning relate (a) to EE as an independent subject, or its infusion into various existing subjects; (b) to the form of EE in theoretical and practical instruction.

EE in higher technical education: The content should include - a general course on environmental issues, with particular reference to polluting wastes and emissions, and the technology used in filtering; desulphurising, neutralising, destructive and storage operations.

- safety principles and practices; industrial hygiene; common health risks and preventive measures; respiratory, allergic, carcinogenic and other effects which may develop slowly; noise levels;
- the activities and norms of various authorities concerned with general and specific environmental issues, e.g. industrial safety, fire risks etc.;
- the socio-, micro- and macro-economic aspects of environmental protection;
- the economic use of raw materials.

All aspects of content should be complemented as appropriate and possible by practical laboratory and workshop experiences. Projects offer a particularly useful way of reaping benefits for students and community as selected environmental problems are studied.

EE in intermediate technical education

The content areas are similar to those in higher technical education; the approach is different. Emphasis should be on:

- practical rather than theoretical aspects;
- the application of known technologies for environmental protection and improvement rather than on the development of new ones;
- specialised, rather than broader-based content.

Other variables to be taken into account in planning EE at this level include:

- the type of functions usually given to graduates in the early years of employment;
- the likely familiarity with general EE principles determined by whether courses run parallel to, or follow, senior secondary education;
- the type of industry which recruits most graduates.

Technicians need to be 'tailor made' for their duties.

On the whole, the content may be defined under three headings:

a) subjects which require reinforcement and/or review training, e.g. continuing safety and health education; waste disposal;

b) complementary training, e.g. for managers, foremen, in responsibility for others at the time of change in functions;

c) updating to convey knowledge of newly discovered environmental risks, or of new materials, products or production methods.

Worker turnover makes further EE a continuing necessity.

7.1.5 TEACHER TRAINING

Teacher and subject diversity

There are three learning situations with different personnel responsible for the teaching process:

- teachers of theoretical subjects in classrooms;
- instructors in practical subjects in college and school laboratories and workshops;
- engineers, foremen, technicians and skilled workers in job-based training and work experience.

Pedagogical training is not usually required of these three groups of teachers. Consequently, the general practice in most countries is still that qualification as a teacher in TVE is essentially based on academic merits for theoretical instruction and practical training and work experience for workshop instruction in practical subjects.

Since there is variety in the levels and sufficiency of such instruction, teachers in the TVE system are an heterogeneous group with widely differing educational levels, types of technical and vocational training, and practical experience outside the educational system.

As in other areas of TVE, EE in teacher training spans a wide diversity of needs, depending on content specialisation and emphasis. It is, however, suggested that there are two aspects to the EE necessary.

a) There is a **core** of general technical environmental training that applies to most lines of teacher training for TVE. This relates to generally applicable work efficiency principles and practices, workplace organisation, common health risks, organisation and sources of information concerning environmental issues including safety and health questions and radiation and emission standards.

b) The bulk of EE for TVE teachers must, however, be narrowly targeted on individual subject areas in the same way as in other TVE. Since this should have been covered in initial TVE, pre-service teacher training should be able to concentrate on reinforcement and filling gaps. In-service training would mostly be directed to updating, or supplying complete training for any teachers without formal initial TVE.

Channels for teacher training might include:

a) teacher training institutions which provide pre-service training;

b) in-service teacher training institutions which may or may not be the same as those in (a);

c) extension services, management training institutions and industrial training and development associations;

d) the mass media, including professional journals commonly reaching teachers and instructors in TVE, and the engineers and supervisors responsible for on-the-job training.

7.1.6 **SUMMARY AND CONCLUSIONS**

The growing importance of environmental issues in modern society and increasing risks of irreversible damage to the outer environment, and accidents in the work environment, emphasise the need for review and further development of EE in TVE.

The subject is difficult for three main reasons, viz:

a) the wide variety of environmental risks originating from various fields of activity;

b) the wide diversity of levels in TVE, providing a range trained personnel from university graduates trained in higher technical education through to workers trained on-the-job;

c) the rapid pace with which change in technologies products, etc., occur.

Thus any strategy for EE in TVE must include provisions for both initial and further training on environmental issues, both at the level of initial TVE and adult further education. Technical staff at all levels carry a heavy responsibility for the protection and and improvement of the environment. Despite this, there is not necessarily a direct link between the TVE persons have received, and the field of economic activity or type of function they may have in working life. Mechanical and electrical engineers and technicians may be working in social services such as hospitals, or in line construction or factory work. Mechanics may end up as maintenance men in office establishments. All this diversity means that EE in TVE must be specifically targeted to well-defined populations and fields of activity, with clear articulation of priority issues in environmental protection and improvement.

EE in TVE should reinforce principles taught in general, but specifically should make students aware of the problems, risks, technological solutions and skills necessary for appropriate action to protect the environment. EE in TVE may be treated as a separate subject where the intention is to build on a general EE base. However, in its essentials, EE should be integrated into the total technical learning process, that is, into the various subject areas, e.g. industrial law, mechanical engineering, building and construction technology, agricultural technology. It should also be a leading theme in laboratory and workshop skill training, constitute subject-matter for thesis work at undergraduate and graduate levels, and form an important part of practical training on the job.

EE in TVE, with the possible exception of industrial safety and health, has been neglected in the past. It has not either been a priority for teacher training in TVE. These omissions must be repaired for the future. Curricula for pre-service teacher-training should be revised to give EE a proper place in them, and in-service teacher-training courses with the necessary emphasis on EE need to be developed for existing technical staff.

A.7.2 STRATEGIES FOR THE INCORPORATION OF ENVIRONMENTAL EDUCATION INTO CURRICULUM AND TEACHER TRAINING FOR INDUSTRIAL SCHOOLS

Summarized by Mr. Milton Pinnock

7.2.1 INTRODUCTION

Man is a part of the natural world of fauna and flora, of soils and air, of water and sunlight. Although these preceded him, whether by creation or by the laws of evolution, man has sought to make the world subservient and responsive to him. He has created a world of artifacts and institutions with the use of his ingenuity and his aspirations.

Man, through his creative activities, has used and modified his environment more extensively than any other living organism. Consequently, he lives in constant conflict with his environment and faces the tremendous challenge of resolving the conflict between his destructiveness and his creativeness.

Man's conflict with his environment has promoted global environmental degradation affecting land, water and the atmosphere. In course of ensuing centuries of industrialization, urbanization and the development of intensive agriculture, man has produced many of the environmental crises now confronting him. Water, air, noise, pesticide and solid waste pollution, excessive radiation levels and the loss of open space, all pose threats to the environment.

It has become increasingly apparent that concern for the environment as a whole is basic to man's survival, and that achieving health requires an organized effort to protect and promote the well-being of all persons within the community.

It is with a knowledge of the foregoing that UNESCO/UNEP, in an effort to promote environmental awareness, presents "specific strategies for incorporating environmental education into curricula and teacher training for industrial education."

7.2.2 ENVIRONMENTAL EDUCATION AND INDUSTRIAL EDUCATION

What is the Environment? Simply put - "the aggregate of external conditions that influence the life of an individual organism or population" while Environmental Education is "an educational process, (problem-oriented and interdisciplinary in character), which aims at building up a sense of environmental values and concern for public well-being among its learners.

The Need for Environmental Education

The need for environmental education is dictated by many factors:

1. In an effort to "develop", governments are often lured by short term gains and lose sight of environmental consequences due to industrial innovations.

2. Environmental damage creeps upon us, too often unheeded until it is too late.

3. Attendant on industrialization are the environmental problems of urbanization with burdens on physical infrastructure and services.

4. The exploitation of natural resources and the discharge of pollutants into the environment.

Understanding these factors and their interrelatedness and recognizing the impact they create on the environment cannot be achieved over-night. This will necessitate a long process designed to inculcate within individuals a commitment to the protection of the environment. To this end, UNESCO, on a mandate from the U.N. Conference on Human Environment, (Stockholm, 1972), is taking the necessary steps to establish programmes in environmental education at various levels of society, with a view of educating man to the simple steps he might take within his capacity to manage and control his environment.

The Development of Environmental Education Philosophy

In the recognition of the characteristics of environmental education, viz., problem-solving, interdisciplinarity, community involvement and continuity, the discipline dictates three main functions:

1. General public education;

2. Special groups education;

3. Professional/scientific oriented education.

Like any other innovation in education, the introduction of environmental studies will affect the philosophies and methodologies. One positive effect, however, is the opportunity to develop an integrated multi-disciplinary approach to the related subjects as a unified whole, e.g. in the studying of the natural sciences.

Goals, Objectives and Guiding Principles of Environmental Education

a) **Goals and Objectives**

In determining goals and objectives for the environmental education, the following must be borne in mind:

i. biological, physical, ethical, cultural and socio-economic constructs;

ii. the inevitable re-orientation and merging of different disciplines and educational experiences;

iii. the interdependence of the modern world;

iv. the need to foster linkages between the educational process and real life;

v. the need to transcend all strata of society;

vi. the need for EE to be an ongoing process.

b) **Guiding Principles of Environmental Education**

The following are considered critical in developing curricula incorporating environmental education at any level:

i. the environment should be considered in its totality;

ii. issues should be viewed from all levels of society; local, national, regional and international;

iii. focus on current and potential Enviromental situations;

iv. the value of local, national and international co-operation in problem-solving;

v. consideration of environmental aspects in development plans;

vi. learner involvement in planning their learning experiences;

vii. the need to relate environmental sensitivity, knowledge, problem-solving skills and values clarification to every age;

viii. discovery of symptoms and real causes of environmental problems;

ix. the complexity of environmental problems and the need for critical appraisal at all times;

x. the utilization of diverse learning environments and educational methodologies.

7.2.3 **TECHNICAL, VOCATIONAL AND INDUSTRIAL EDUCATION**

What is technical education? According to the UNESCO Consultation Meeting, Singapore, (March, 1986), technical education is a system of further/higher education which includes all educational programmes which prepare students for a variety of occupational specialisations in industry and agriculture. The vocational tracks in comprehensive high schools and extension courses for upgrading of workers, are also included.

Industrial education on the other hand embraces craft, skilled trade and semi-skilled operations.

Basic to a sound technical, vocational and industrial education, is the need for a comprehensive understanding of social, civic and ethical relations as dictated by society.

Role of the Skilled Workers and Technicians

Craftsmen and skilled workers are mainly involved in working with their hands, operating machines and assembling products, while technicians are usually employed in:

1. production, operation or control;

2. installation, maintenance, or sales;

In a hierarchy of abilities presented in the order:

1. Managers;

2. Industrial scientists, technologists and engineers;

3. Technicians;

4. Craftsmen and skilled workers;

5. Semi-skilled operative;

6. Unskilled labourers.

The technician lies between the manager and technologist on one hand, and the craftsmen and semi-skilled operative on the other.

In summary, industrial education refers to the educational and training processes which include, in addition to general education, the study of technologies and related science programmes and the acquisition of practical skills and knowledge relating to occupations in the industrial sector.

Aims and Objectives of Industrial Education

Industrial education should consider the need to:

1. keep pace with industrialization and modernization;
2. provide manpower for industry and commerce;
3. develop students into responsible citizens;
4. provide an opportunity to each individual for optimum development;
5. protect and conserve the environment.

Role of Industrial Education in Environmental Change

Responsibilities of Industrial Education - more and more the responsibilities of industrial education point beyond the mere imparting of technical knowledge and skills for gainful employment. Like other instruments of social change, such institutions must address concern and interest including environmental protection in the societies in which they exist. This need is supported by the following factors:

1. One of the main causes of environmental degradation is rapid industrialization, and with the same breath, institutions offering industrial education are supplying the skilled manpower for such industries. Environmental education can also be provided concurrently with industrialized education.
2. Institutions in industrial education have existing infrastructure which can be utilized quickly and profitably for imparting instruction in environmental education.
3. Institutions in industrial education have technically qualified human resources who, with minimal re-orientation, can be trained to impart instruction in environmental education.
4. The student community can be utilized in developing contact with the general public in advancing environmental awareness and protection.

5. The institution's linkages with the community and other organizations can be channeled into environmental awareness and problem-solving approaches.

Industrial Education has a pivotal role to play in bringing about environmental change, demonstrated in two distinct types.

1. **A Reactive Role** where most systems and institutions respond positively to public and governmental requirements and adjust their activities, policies and programmes to suit changing requirements.

2. **A Pro-active Role** where the institution regards it as its duty to utilise its expertise to foresee environmental problems by direct community involvement and by developing courses and programmes offering solutions to these problems.

In addition to student oriented programmes, institutions can take an active role in sensitizing society to ecological needs through direct involvement, viz,

1. informed citizens can influence public opinion and public pressure;

2. specific labour organization e.g. unions, can create an impact at the workplace;

3. small organizations e.g. parent-teachers associations can influence their communities.

Environmental protection is largely achieved if each individual has been inculcated with a sense of values, a concern for correct resource husbanding and management, a concern about his own health and welfare, and an appreciation of what constitutes a good local community environment.

The actual environmental education role played by institutions in industrial education, however, varies widely from country to country and institution to institution. Variations may be due to:

1. National policy on environmental education;

2. Objectives and roles assigned to the education sector in general and to vocational/industrial education in particular, in relation to environmental education;

3. Extent of existing linkages between education and the environment ministries;

4. The location of an institution and the nature of its surrounding community;

5. Linkages by the institution with industries, other organizations and the community;

6. The leadership of the institution;

7. The corporate reputation of the institution;

8. Commitment of staff and students to environmental education;

9. The nature of the curriculum and its responsiveness to environmental education needs.

Of course, very important to the consideration of the foregoing factors, is the necessary administrative backing and financial support by government for the institution to function effectively.

7.2.4 THE NEED AND PLACE OF ENVIRONMENTAL EDUCATION IN INDUSTRIAL EDUCATION

Over the years, the need for environmental education in industrial education has been largely ignored. The TBILISI Conference, USSR, 1977, has revived this focus with the following goals:

1. To develop attitudes and behavioural patterns in pupils which will enable them to make decisions concerning the necessity of preventing the deterioration of the environment through respect and understanding of the ecological equilibrium;

2. To increase man's awareness of his responsibility for his actions in relation to the environment and their immediate and long-term repercussions;

3. To protect and preserve natural resources, and use them rationally in light of ecological situations;

4. To help to bring technology to bear on total development, bearing in mind the intricacies of socio-cultural dimensions;

5. To increase the local problem-solving capacity of technical education in the existing education system.

It is very important that these goals be considered when objectives for industrial education are being developed. The objectives must be detailed and specific in order to address the required content of the curriculum.

Curriculum Content

In reality, environmental aspects should be incorporated into all areas of industrial education, the details of which, however, require specialist inputs.

Methods

Curriculum development is much more than identification of subjects, topics and syllabi for instruction, but involves sequencing, time scheduling, preparation of instructional objectives for each subject and topic with supporting resource materials and schemes for evaluating students' performance.

Models

The integration of environmental aspects into the industrial education curriculum may take one or a combination of three models.

1. Conducting a special course or series of lectures on environmental problems in general to draw students attention to national concerns;

2. Providing an introductory course during the first year and a choice of more in-depth courses in subsequent years;

3. Reviewing the entire curriculum and re-organising it so as to include environmental protection as an integral part of the curriculum.

Conditions and constraints will dictate the final choice of these models.

Steps in Curriculum Development

1. Organize a curriculum core development team (CDT):

   - choose members;
   - establish tasks and time frames;
   - collect appropriate resources, e.g., materials and professional references;
   - identify constraints and plans for resolving them.

2. Identify professional consultants who will serve as Recommended Support Team ((RST);

   - establish tasks and time frames;

- identify liaison procedures to be used between RST and CDT.

3. Develop the curriculum's scope and sequence:

   - define goals;

   - define concepts, skills and attitudes to be incorporated as objectives into the curriculum (the scope);

   - assign objective components to appropriate levels and content area (the sequence).

4. Evaluate the existing school programme with respect to potential environmental education infusion elements:

   - identify environmental education objectives in the existing curriculum;

   - identify materials in the curriculum which could be modified to meet environmental education objectives;

   - identify deficiencies in the curriculum where new materials must be selected or developed.

5. Inventory and evaluate resources available for use in the curriculum.

6. Prepare the curriculum:

   - Review and evaluate the materials which have been collected for potential adaptations or adoption;

   - Organise writing teams to adapt or develop environmental educational materials needed.

7. Develop plans for both pilot and full scale implementation.

8. Develop a comprehensive evaluation programme.

The process of curriculum development is complex and time-consuming, and each course should be taken individually as well as part of the whole. The next logical step is the **preparation of objectives and topic sequencing** followed by detailed **teaching schemes and lesson plans** for each of the lessons to complete the curriculum document.

INSTRUCTIONAL METHODS

It is necessary to have a fair balance in the acquisition of knowledge and skills and the development of attitudes. To achieve this it is recommended that emphasis is placed on:

(a) Community work by students;

(b) Laboratory and workshop activity;

(c) Project work (individual or group);

(d) Social and voluntary activities.

These approaches may mean:-

- less reliance on traditional didactic presentation;
- more of group discussions, seminars, role-playing, simulation exercises, etc.;
- self-directed learning.

All this may require

(a) re-orientation of teachers;

(b) proper instructional resources;

(c) interaction between school and country at all levels.

Evaluation and Assessment

This may be divided into

(a) Student assessment;

(b) Course and programme evaluation.

Student Assessment

It is important to ensure that performance evaluation

- is in accordance with curriculum objectives;
- assesses knowledge, skills and attitudes;
- includes various types of instruments - essay objective type, rating scales, etc.;
- is compulsory for all students;
- ensures that outstanding performance be appropriately rewarded;
- uses field preceptors in evaluation exercises.

Course and Programme evaluation

Courses and programmes take time to achieve perfection, therefore continuous evaluation is necessary for adjustments and updating. Evaluation should be ongoing as well as summative.

7.2.5 ESSENTIAL ENVIRONMENTAL KNOWLEDGE AND ENVIRONMENTAL METHODOLOGIES FOR CURRICULUM DEVELOPMENT AND TEACHER TRAINING FOR INDUSTRIAL SCHOOLS

Factors affecting the choice of environmental education components in industrial schools

Components depend on several variables and factors which may be identified by adopting two different approaches

1. the recognition of manpower needs and instructional constraints;

2. building on environmental education obtained in previous schooling;

Both approaches must still, however, take into consideration what might be covered in a broad-based secondary school curriculum with emphasis on environmental aspects.

Essential Components of Environmental Education in Industrial Schools Philosophy

The basic educational philosophy on which industrial education rests dictates that environmental subject content may fall into four main categories

(a) Compulsory core subjects - all disciplines will need to study;

(b) Compulsory related subjects - all students belonging to a particular discipline or trade;

(c) Elective/optional subjects - related to the discipline, but may be chosen in accordance with aptitude/interest or needs of the profession;

(d) Common electives for all disciplines - these elective subjects can be chosen by any student and offered as advanced topics which may be useful in the occupation he wishes to take up.

Environmental Education in Teacher Education and Training

The successful incorporation of environmental education into the curriculum of industrial schools depends upon the teacher - his competencies, knowledge, skills, abilities, attitudes and values. It is therefore imperative to improve the skills of the teacher in relation to environmental matters. This may necessitate one of two approaches:

1. A programme for teachers not yet trained;

2. A programme for teachers already trained.

For category 1, there is need to design a comprehensive training programme, incorporating environmental areas in the curriculum: and for category 2, there are alternative strategies such as:

i. short refresher/continuing education programmes in environmental education;

ii. workshops focusing on a specific curriculum area newly introduced;

iii. self-instructional modules through a distance education scheme for enviromental education.

7.2.6 GUIDELINES FOR INCORPORATION OF ENVIRONMENTAL EDUCATION INTO INDUSTRIAL EDUCATION CURRICULUM AND TEACHER TRAINING

The extent of integration achieved and the fulfillment of the objectives of environmental education will largely depend on

1. Government policies on environmental protection;

2. The complexity and size of the industrial education system;

3. Pressure group advocacy;

4. Flexibility of curricula in industrial schools;

5. Level at which environmental education content will be provided;

6. Time and money available;

7. Responsiveness of industrial schools to societal needs.

General Background

Necessary to the efforts of incorporation are the assumptions and constraints here listed:

1. Governments are committed to environmental protection and the incorporation of environmental education into industrial education curricula;

2. Incorporation can be effected smoothly and simultaneously at primary, secondary and tertiary levels;

3. Environmental education is fully integrated with all other sectors of education and environmental awareness and consciousness is the core on which all education is built;

4. Some basic ground work has already been done at secondary levels.

Policies, Aims and Approaches

(a) Environmental education is a matter of global concern; its objectives, therefore, should be based on clear-cut policy directives. Policies should stress:

- the ingredients for bringing about environmental change and awareness;

- the introduction of environmental education at all levels - with compulsory aspects

(b) There should be integration of the aims and objectives of environmental education and industrial education to ensure the appreciation of the technological and ecological constructs.

(c) An exposure to environmental education should extend to all related practitioners through both formal and non-formal programmes.

(d) Environmental education should build on previous knowledge and experiences.

(e) The crucial nature of environmental education at this time should be recognised.

(f) It is essential for developing an appreciation for the environment and ecology on a scientific and technological basis.

Strategies for integrating Environmental Education into Industrial School Systems

Ideally, integrating environmental education into industrial school systems should be implemented through the following mechanisms:

(a) Environmental Education Committee;

(b) Environmental Education Co-ordinator;

(c) Curriculum Development Unit;

(d) Instructional Materials Preparation Unit;

(e) In-Service Training Unit;

(f) Community and Industrial Liason Unit - with all units working in harmony to effectively integrate the environmental and related components.

Models, Patterns and Structures

Several options may be followed in integrating environmental education into industrial education systems. Whichever is chosen, it is necessary to ensure that:

- community needs are served;
- the course conforms with modern technology and the needs of employment market;
- engineering and environmental aspects are integrated;
- the environment is considered in its totality;
- the continuous lifelong nature of environmental education is recognised;
- the approach is transdisciplinary;
- there is emphasis on participation in problem-solving;
- learners play an active role in planning their learning experiences;
- there is a focus on current and potential environmental situations;
- consideration is given to environmental aspects in plans for development;
- global environmental issues are examined;
- there is a focus on the learner's community, but those comparisons are drawn with wider fields;

- environmental sensitivity, knowledge, problem-solving and values related to every strata of society;

- the complexity of environmental problems is emphasized;

- diverse learning environments are utilized.

In the case of existing courses, environmental aspects need to be introduced incrementally with major structural changes taking place in planned stages.

In this period new programmes should replace traditional ones. Smooth transition needs to be ensured to prevent unfavourable repercussions.

Curriculum and its Development

The curriculum development process should address the requirements of various disciplines, giving due consideration to core, compulsory and optional subjects. It should be detailed and supported by the production of instructional materials for student use. The curriculum should be tested before implementation and thereafter reviewed periodically for relevance in time.

Instructional Methods - as already emphasised, should be geared to develop attitudes, values and problem-solving skills, utilising more self-directed learning and community involvement. The team approach should also be emphasised.

Industrial/field Training

The duration of this training may differ from country to country or even within a country. Specific guidelines to be considered should include:

(a) the purpose of industrial/field training - emphasis on environmental and ecological aspects;

(b) the relationship between operations and environmental protection;

(c) a study of manufacturing processes and their impact on the environment;

(d) attention to national standards;

(e) the problems faced in maintaining ecological balance;

(f) efforts to overcome problems.

Field training should be motivating and interesting; should be related to the curriculum and community needs and above all, useful and beneficial to the industry. Whenever possible, awareness for on-the-job training should be explored.

Supervision is of utmost importance and should benefit from comprehensive evaluations.

Instructional Materials and Media

Every effort should be made to produce local materials; books, slides, film strips, etc. and the utilisation of available resources, e.g., television and radio to support the teaching/learning process.

System Management

Implementation of environmental innovations will require expert management. Thought must be given to:

1. rationalization of need for environmental education;
2. awareness by all concerned of government and system policies;
3. detailed planning;
4. flexibility in approaches;
5. support of industries;
6. proper linkages between institutions and communities.

Recommended activities and documents needed by each country for incorporating environmental education into industrial schools.

In addition to institutional efforts, the UNESCO Consultation Meeting recommends that national governments initiate:

1. the development of prototype curricula, programme structures, methodologies and teacher-training programmes;
2. the development of suitable text-books, work-books, instructional modules and teaching aids, including films and video programmes;
3. mechanisms for the exchange of information;
4. the organisation of periodic conferences, training seminars and symposia;

5. the institution of awards and prizes for outstanding achievements in environmental education;

6. pilot programmes and research activities;

7. the establishment of national centres;

8. other national and regional level activities.

7.2.7 **CONCLUSIONS**

The successful incorporation of environmental education into curriculum and teacher-training for industrial schools will necessitate the continued, sustained efforts of teachers, students, industry, community, the institutions and national governments. This incorporation points to the only way possible to solving the technological problems associated with industrialization, mass exploitation and manipulation of the environment. Success will no doubt enhance ecological harmony and ultimately man's survival.

7.3. CASE STUDY ON THE INCORPORATION OF ENVIRONMENTAL EDUCATION INTO THE CURRICULUM OF TEACHER TRAINING OF TECHNICAL SCHOOLS IN SINGAPORE, UNESCO

Summarised by Mr. Andreas Oberli

7.3.1 INTRODUCTION

The Republic of Singapore has a population of just over 2.39 million (mid-1980), living in an area of 616 square kilometers. This gives a population density of more than 3,880 people per square kilometre, the second highest in the world. The island of Singapore is mostly flat, with elevations of no more than 166 metres.

Situated almost on the equator, Singapore has a high annual rainfall, high humidity and warm temperature, conditions which can foster rapid bacterial growth, organic decomposition and the propagation of vectors.

Major environmental problems and issues are: land scarcity, industrialization and pollution, solid waste disposal (2,700 tonnes per day), vector-borne disease (endemic dengue fever), and food-borne disease (street vendors).

Singapore has a separate ministry of Environment which has been in existence since 1972. This Ministry, in close collaboration with the Ministries of Health, Education and National Development has achieved a fair amount of success in tackling environmental problems.

The clean roads, tree-lined avenues, abundance of parks and gardens, low level of noise and air pollution, the near absence of littering, higher standards of health etc. are some of the evidences of a clean and healthy environment. There exists a clearly discernible consciousness towards protecting the environment among the general public, possibly as a result of several campaigns for the purpose.

7.3.2 ENVIRONMENTAL EDUCATION AT SCHOOL LEVEL

Subjects in the curriculum include content related to the study of ecological and environmental education.

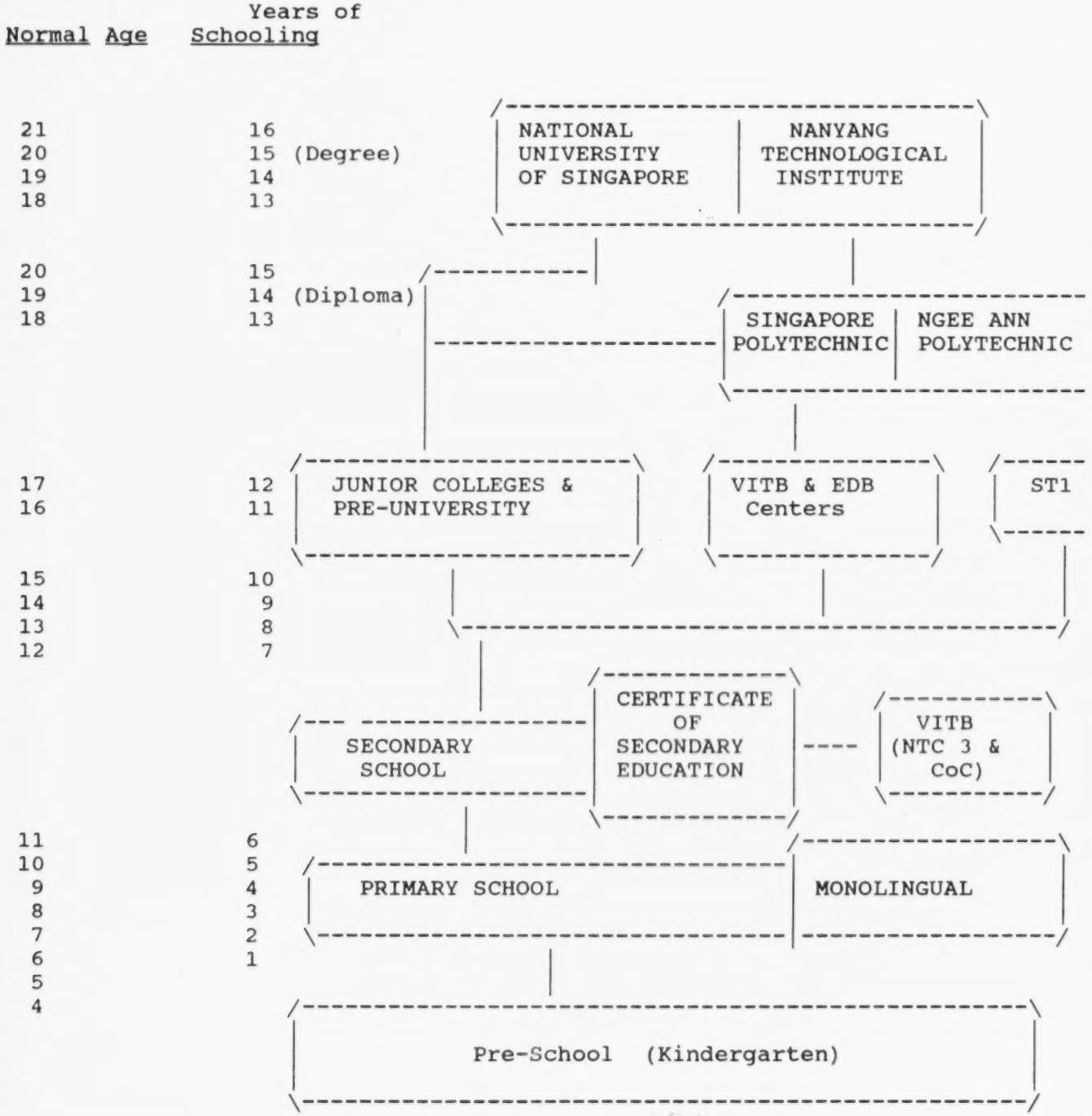
At primary 3 to 6 levels, emphasis is placed on the main theme "Man and His Environment" in the Science Curriculum.

At the upper secondary levels (secondary 3 & 4) students can take the subject "Human and Social Biology" which includes relevant topics of Environmental studies and population education.

The schools have been actively involved in the National Health campaigns since they were first launched in 1968. These campaigns are annual events lasting one month. Specific health hazards have been highlighted each year, e.g. mosquitoes, drinking water, food handling. Students take part in competitions such as slogan and poster designing, quizzes, debates, oratorical contests and essay/song writing.

7.3.3. EDUCATION SYSTEM IN SINGAPORE

The broad structure of the Education System together with normal age pupils and years of schooling is indicated below:



Some significant developments and innovations introduced in recent years are:

1. Streaming of pupils according to their academic abilities. Pupils can move laterally from one course to another on the basis of their performance. From 1984, a special programme has been introduced for gifted pupils.

2. Computer education is making considerable headway in schools. As of 1984, about 134 schools and junior colleges have computer clubs with a membership of 13,000. The long-term objective is to make every secondary school leaver computer literate. At the junior college level, each college is equipped with a multi-access micro computer system and about 1,000 students in all the eight colleges are offered computer science as a subject for the A-Level examination.

3. The Ministry of Education decided to adopt English which is the official language for commerce, insustry and public administration as the medium for instruction in all schools by 1987. The other mother tongues (Malay, Chinese and Tamil) will be taught as second languages at all levels.

4. Since January 1984, religious knowledge education has been introduced in upper secondary schools with a view to imbue students with moral values so necessary in the modern world characterized by rapid changes.

5. The Nanyang Technological Institute (established in 1981) conducts Engineering Degree courses aimed at producing practice-oriented engineers to meet the demands of Singapore's restructured economy. The special feature of the course is a 25-week industrial attachment in the third year.

7.3.4 TECHNINICAL EDUCATION SYSTEM

Background

1. Objectives of Technical Education:

The Technical Education System in Singapore is designed to adequately meet the demands of the specialized nature of industry in a country which lays greater emphasis on high technology and automation aimed at increased productivity and cutting down manual labour, which is scarce. Consequently the courses are geared to meet the needs of the machine - intensive

manufacturing sector which makes use of computers to control production processes and is fast moving into the area of industrial robotics.

At the lowest (certificate) level, the objective of the system mainly under the Vocational and Industrial Training Board is to provide a pool of junior technicians for careers in the Engineering disciplines (Mechanical, Electrical and Electronics Engineering).

At the Diploma (Polytechnic) level, the objective in both the polytechnics is to produce middle-level technical man-power for the country's economy.

At the Degree level, while the National University of Singapore produces engineering graduates with a high level of theoretical knowledge, the Nanyang Technological Institute produces practice-oriented engineers to meet the particular demands of Singapore's restructured economy.

2. **Levels and Duration of Schooling:**

a) At the certificate level, the V.I.T.B. (Vocational and Industrial Training Board) has been established to:

- provide institutional training for school leavers,
- register apprentices and offer part-time continuing education and training,
- set national skills standards,
- conduct public trade testing and certification of skills.

A variety of Certificates are being offered with course durations from three months to two years.

b) At the Diploma level the two polytechnics offer Engineering courses of 2 to 3 years (full-time) and 3 to 5 years (part-time), depending on the students' qualifications.

c) At the Degree level, all engineering students undergo a common course for the first year at the National University of Singapore's Faculty of Engineering. The students have a choice of completing the remaining three years of the course either at the University or at the Nanying Technological Institute, but they all receive the same degree of Bachelor of Engineering from the University. While the four-year course at the University has engineering science orientation, the course at the N.T.I. is highly practice and application oriented.

3. **Enrolment and Output**

The latest enrolment and output figures in the various institutions are given below:

Name of the Institute/University	**Enrolment**	**Output (No.of graduates/year**
V.I.T.B. (As in 1983)	10,375	7,229
Singapore Polytechnic (as in 1983-84)	6,770 plus 4,970 part-time	2,867
Nge Ann Polytechnic (As in 1983)	4,931	1,188
Nanyang Technological Institute (As in 1984-85)	2,078 Expected to reach 2,800 in 1990-91	577
National university of Singapore	13,656 (for all degrees)	441 (engineers)

4. **Degrees, laws, Rules and Regulations Requiring the Incorporation of Environmental Education in the Curriculum:**

There are no specific Laws, Rules and Regulations requiring the incorporation of Environmental Education in the Curriculum of Technical and Vocational Education in Singapore; yet it appears that the inclusion of these components has been a result of two main factors:

- the increased awareness of the general public in sanitation, health and related matters due to high levels of literacy and standard of living.

- creation of sufficient employment potential in technical occupations related to sanitation, waste disposal, water supply, health care, environmental protection etc.

Board details of the curriculum for various courses at Certificate, Diploma and Degree levels in Technical and Vocational Education are given in the appendix of the original paper. They indicate the extent of specialization in each course and the accent on high technology which is a common characteristic of all industries in Singapore.

Teacher-Training

A. **For General Education**

Institute of Education

In Singapore, the Institute of Education, established in 1973 is the centre for Teacher Training. It provides pre-service training for graduates and non-graduates to become new teachers and further training for in-service teachers.

B. **Vocational and Technical Education**

There is no formal teacher training for teachers in technical and vocational education. Whatever training is needed, is provided to new teachers through facilities available in the V.I.T.B., the two polytechnics and the University as described hereunder. The teachers in these technical institutions also attended special courses and workshops conducted by the Colombo Plan Staff College for Technician Education.

Vocational and Industrial Training Board:

The V.I.T.B. in Singapore conducts its own Staff Development programme at the Centre for Vocational Training of the Board. All newly recruited V.I.T.B. training staff are required to attend this course as part of their pre-service training and obtain a Certificate in Vocational Education (CVE). They generally would have had industrial experience of several years before joining the Board.

Ngee Ann Polytechnic:

This Polytechnic has an Educational Technology Centre which provides service to departments and staff with the principal aim of maintaining the highest possible quality of teaching and learning at the Polytechnic.

To achieve this aim, the Centre engages in three main activities. These are:

(1) The organization and conduct of a Teaching Methodology and Induction Course for all new members of the academic staff, except those staff having a formal teaching qualifications.

(2) The production of instructional materials. Excellent facilities are provided for staff who wish to make any sort of teaching and learning resource materials.

These include a purpose-built colour television studio with associated editing equipment; a telecine chain for the transfer of 16 mm film or tape slide presentations to videotape; a

teachers' workroom where equipment is provided for the rapid production of overhead projection transparencies, charts, diagrams, models and other teaching aids; micro computers for staff to design computer-assisted learning programmes; camera and colour darkroom facilities for the preparation of slides and other pictorial materials; special equipment for the production of multi-image presentations; and the advice and assistance of instructors, graphic designers or technicians.

(3) The purchase, control and maintenance of all audio-visual equipment on the campus.

Singapore Polytechnic

The Department of Educational Technology supports the Polytechnic's curriculum development activities by conducting courses and seminars in teaching methods for staff new to teaching and for staff involved in course design and development.

The Department's Audio Visual Aids Unit includes a TV studio and portable TV recording facilities together with an extensive range of audio-visual equipment for use in the Polytechnic's classrooms and lecture theatres.

National University of Singapore

The University has recently established a Centre for Educational Technology with a view to provide trainig in the Educational Media and establish support services in Media Design and Production for internal use by the University.

Information on teacher-training at the Nanyang Technological Institute is not available.

7.3.5. THE ENVIRONMENTAL EDUCATION COMPONENT

EE Objectives

Among the developing countries, Singapore realized the importance of environmental education relatively early and introduced it as an essential component of education at different levels in its education system. Curricula of primary and secondary education are implicit by inclusion of different aspects of environmental studies and population education (as mentioned at the beginning of this paper).

Thus, the average secondary school graduate who enters the Technical and Vocational Education system is already tuned to his responsibilities towards the environment and its

preservation. The curricula of Technical and Vocational courses generally builds on this foundation by superimposing concepts of energy conservation, efficiency, noise prevention, water and air pollution etc.

I. **The Vocational and Industrial Training Board:**

The purpose of most training courses at the V.I.T.B. is to produce highly skilled craftsmen some of whom are employed as motor vehicle mechanics, air-conditioning and refrigeration mechanics, welders, machinists, fitters etc. The duties of these craftsmen include checking of motor vehicles for noise, vibration, condition of brakes, oil and exhaust fume, fire detection and protection and the like, which are closely related to the environment and its preservation.

The curriculum objectives accordingly place emphasis on the understanding of these phenomena, the reasons for their occurence, the dangers posed by them and the preventive measures needed to be adopted.

II. **The Polytechnic System:**

The curriculum of courses at the polytechnics are not written in terms of objectives. However, form the analysis of the content prescribed for the different courses of study, an inference can be drawn that these courses, besides emphasising professional knowledge and competence, also provide adequate training in interpersonal and supervisory skills. This management of the human environment aspect is covered in all disciplines under one or more subjects.

III. **Degree-level Courses:**

EE objectives in these courses tend to cluster more around awareness and high degree of professional knowledge of the technological practices in the area of environmental control and protection. More emphasis is laid on the design, operation and maintenance at the system level and on inter-disciplinarity.

EE Components in the Curriculum

1. **Certificate Courses in V.I.T.B.**

EE is not imparted through a separate subject in the training programmes offered by V.I.T.B. However, components of EE such as noise pollution, ventilation, chemical handling, vibration control etc. are covered as topics in related engineering subjects. Some typical examples are:

- Determine the permissible noise levels of air-conditioning equipment for various applications. e.g. concert halls; residential buildings; hotels, offices, etc.;

- State the methods of safe handling of refrigerants;
- Explain food poisoning;
- Explain the Water Pollution and Drainage Act 1975;
- Checking and adjusting exhaust emission levels in accordance with legal standards;
- Describe effects of noise and vibration on human reactions.

2. **Diploma Courses at the Polytechnic**

The following are the environmental education components of Diploma courses in Engineering and Technology offered at the **Singapore Polytechnic:**

(a) Environmental Science: Studies of factors and problems related to the environmental conditions and confort requirements of buildings and spaces with regard to heat, ventilation, light and sound);

(b) Water Supply and Sewage;

(c) Thermal and Environmental Engineering;

(d) Engineering Fundamentals and Pollution Control.

The **Ngee Ann Polytechnic** offers a Technician Diploma course in Environmental Engineering in two streams - a Building Services Engineering stream and a Sanitary Engineering stream this is a three-year full-time course. The subjects covered in these courses are the following:

Hydraulics and Hydrology
Water Supply Engineering
Water Quality Analysis and Treatment
Water Treatment and Waste-water Engineering
Pollution Control
Public Health Engineering Construction
Building Water and Sanitary Services
Building Construction and Maintenance
Building Water and Fire Protection Services
Building Sanitary and Gas Services

3. **Degree-level Courses in Engineering and Technology**

The Department of Civil Engineering at the National University of Singapore offers courses teaching environmental aspects as follows:

a) Environmental Engineering I (waste-water, water quality management, etc.);

b) Environmental Engineering II (solid wastes);

c) Air Pollution;

d) Advanced water and waste-water Engineering;

e) Environmental Modelling;

f) Urban Environmental Management (refuse collection systems, air pollution control, etc.);

g) Water Quality Management;

h) Environmental Health Engineering;

i) Industrial Waste-water Control.

The Department of Chemical Engineering and the School of Civil and Structural Engineering of the Nanyang Technological Institute offer similar courses.

Under the course on architecture, three subjects relating to environment are offered:

a) Environmental Control I (Building Climatology);

b) Environmental Control II (Design criteria in the hot, humid tropics; principles of air-conditioning; light and vision; sound and hearing);

c) Environmental Control III (Environmental control systems, e.g. artificial climate, lighting, etc.).

It is only in the Arts and Social Science Faculty that courses in sociology, economics and geography appear.

EE Methods

The methods of instruction most commonly used for imparting instruction in the subjects that include components of EE in all the institutions are: lectures, tutorials, laboratory/workshop sessions, field assignments and group projects.

Assessment and grading include practical work, project work, attitudes and values, with continous assessment playing a major role (e.g. 50% at Singapore Polytechnic).

7.3.6. **CONSTRAINTS**

By and large, there do not appear to be any major limiting or constraining factors for the incorporation of environmental education subjects in the curricula of technical and vocational

education courses in Singapore. A few of the problems encountered were:

1. Environmental studies are considered to be secondary to other subjects in the technical courses which are more common and practical, i.e. Building Construction, Civil Engineering Design, Architectural Design, etc.

2. The absence of any Decrees, Laws, Rules and Regulations passed by the Government requiring the incorporation of Environmental Education in the curriculum is conspicuous, even though much has been achieved even without these formal policy statements and white papers. It is felt that these are necessary to ensure uniformity and for bringing about a dedicated effort in this direction. These would also help to ensure that curriculum developers give adequate weight to EE components while conducting periodical exercises of revision, restructuring curricula in response to fast-changing technology.

3. It is also noticed that the incorporation of Environmental Education components in the curricula for teacher-training in Singapore has been rather marginal. This is particularly true of teacher-training programmes for technician and vocational teachers which are offered mostly within the institutions.

7.3.7. **RECOMMENDATIONS**

Fortunately, in Singapore, almost all institutions in technical and vocational education have incorporated EE components in their curricula to a greater or lesser extent depending upon the situation and the needs of the course. There is however, a scope for more intensified treatment of these aspects in each related discipline and an integrated treatment of the topics across disciplines and subject boundaries. Specific recommendations in this regard would be:

1. To include components of EE in the curricula for teacher-training;

2. To emphasize the technological aspects of environmental protection to students through case studies and specific projects of an interdisciplinary nature;

3. To specify clearly the objectives of EE components of courses;

4. To encourage teachers to write textbooks and produce other print and non-print teaching/learning resources for EE components in curricula. Such materials could be made available to institutions in other neighbouring countries.

7.3.8. **CONCLUSION**

To sum up, the incorporation of EE components into the curricula of Technical and Vocational Education in Singapore can be rated as a fairly successful exercise judging from the impact it has already produced and the potential it has for the future. In many ways, this could be an example worth emulating by many countries in the Far East which have climatic, cultural and other similarities with Singapore. However, many of the advantages which Singapore possess such as small size and population, high literacy levels, technological development, good living conditions, stable economy, greater civic consciousness, etc. may not be available to other countries in the region and these are perhaps partly instrumental for this success story. Much greater national effort, planning and coordination may be needed in other countries even to achieve the same level of success.

7.4 CASE STUDY ON THE INCORPORATION OF ENVIRONMENTAL EDUCATION INTO THE CURRICULUM AND TEACHER TRAINING OF TECHNICAL SCHOOLS IN CZECHOSLOVAKIA.

Summarized by Ms. Vilma McClenan

7.4.1 INTRODUCTION

Environmental Education (EE), in secondary technical schools cannot be conceived in isolation but as a specific part of EE in the general educational system, and to the entire social system. For this elaboration it is necessary to clarify current relations of man and the environment, approaches to solution, the function of EE with regard to the present and in perspective and the problems of the specific position of secondary technical schools in the system of EE. On this basis it is then possible to rationalize the objectives, content and methods of EE in secondary technical schools in order to verify and prepare for its implementation in school practice, and teacher training. In Czechoslovakia great attention is being devoted to EE in connection with scientific, technical and economic development. EE is being addressed within the framework of extensive pedagogical research and linkage with school practice. The results of research are being incorporated in educational documents gradually, systematically and purposefully.

The UNESCO project related to the problems of secondary school EE was very significant in this respect.

This case study contains:

1. Chapters briefly characterizing the basic approach to the concept of EE in secondary technical schools;

2. The extensive part of the study dealing with implementation of EE in the curricula of secondary technical schools, that is, the methods and pre-conditions of the implementation of EE in school practices.

3. Teacher training for EE.

Basic Postulates of EE in Secondary Technical Schools
Concept of the problem area of the environment

Current environmental problems are the consequence of the dynamic relations between man and the biosphere. The generally valid ecological laws are manifested in the enormous variability of life, and in the various and constantly changing conditions

of the environment. Man, by his biological substance, is an integral part of this natural cycle; in it lies the basis of his existence i.e., the social essence of man.

Man's relations to the environment are not only ruled by basic ecological laws which apply in nature, but also by economic, socio-political, aesthetic, ethical and other aspects. Man's environment thus not only incorporates the natural components, but also the artificially formed and social components with all their inter-relations. This specificity of man's relations to his environment may be described as being complexly ecological.

The velocity and direction of scientific and technological developments has not only influenced economic growth but also brought with it the threat of war with the attendant consequences to man and all other forms of life. It has brought about increased demands on natural resources, with increased waste production, posing problems of pollution of air, water, soil, and biota, and endangering the health and quality of human life.

In a historically short period of time man's way of life has changed very quickly, in his relationships to nature. Unless therefore, the negative impacts of man's activities on the environment are removed, further scientific and technological progress with their associated economic growth, and which fail to observe the laws of the biosphere, would in fact threaten man's very existence. Man must strive to use new trends in the development of science and technology and must directly orient this development to the solution of ecological problems.

This means that man must learn to know, understand and respect the ecological needs of his own relations to the environment, and should outwardly and thoughtfully preclude all other negative impacts on the environment related to scientific, technical and economic development and to changes in the life of people.

How and to what extent we shall succeed in implementing ecological principles in the life of every individual and in life's social entities depends on the attitude of people to the environment. This depends on whether people realize their problems in relation to the environment adequately and correctly and whether they intend and know how to solve them. The formation of man's environmental attitudes is a very complex life-long process.

Concept of Environmental Education

Environmental education is conceived as the complex influencing of man's attitudes towards the environment on the basis of the

knowledge, understanding and observance of the laws of the biosphere and all-round inter-relations of man and the environment.

EE is implemented at many inter-related levels, i.e., in the family, in the school, in out-of-school education (which is implemented through various organizations and institutions, including the mass media); in the process of self-education and self-instruction, mainly from practical experiences. The character and quality of the environment in which man lives as an educational factor should also not be neglected. It should also be emphasised that the EE system must reckon with the different methods of education and their impact on members of different age ranges of the population, i.e., on children, on young people, and on adults.

Education must take into account the measure of responsibility and specific nature of various professions, their position in the societal division of labour and in relation to the solution of environmental problems. It must also take into consideration the regional aspects of the environment, and dynamics of man's relations to the environment and the envisaged developmental stages in the solution of environmental problems, based on the related setting of **short-term and long-term objectives for the formation of environmental attitudes.** All the above and other possible aspects should be considered as mutual relationships.

Short-term objectives for the formation of environmental attitudes should include the limiting of negative impacts on the environment, the establishment of responsibility, sensitivity, initiative, activity and ingenuity in the solution of environmental problems. The focus of **long-term goals** should more explicitly be shifted to the purposeful and consistent prevention of negative impacts on nature and to the development of creativity in the establishment of optimal relations between man and the environment. It is evident that there does not exist any accurately defined boundary between the short-term and long-term objectives for the formation of environmental attitudes, and that long-term objectives must follow up on short-term objectives, (i.e., on the first stage); that is they must proceed from it and develop it.

Short-term objectives of environmental education are specially important for that part of the population in whose hands rest the current solution of existing environmental problems, i.e., the adult population and youth who will be active in practice in the near future. The influence which we have on the attitudes of individuals will be manifested in the individual's life and in the general attitudes of society towards the environment. **Man's attitude to the environment always has two basic aspects.**

(i) **as a citizen**, i.e., someone with certain basic vital needs and with certain attitudes to nature, to the history, the current state of society in which he lives and to other people, as someone with certain moral principles, a hierarchy of life values and with specific interests, pre-requisites and possibilities.

(ii) **as a worker** with a certain position in the societal division of labour; with a certain level of theoretical and practical preparedness for his profession and with a certain level of professional responsibility, a measure of creativity, abilities and activeness. The **civic and professional aspects of man's environmental attitudes are closely interrelated, but need not always be in full harmony**. For example, man as a citizen may have high demands on the quality of the environment, while in his working function he may lack professional responsibility, or does not have adequate qualifications or abilities for solving environmental problems; or vice versa.

EE must therefor very thoughtfully take into consideration the influencing of both the civic and the professional aspects of man's attitude to the environment and their interrelations.

In-so-far as it is to be effective, EE must penetrate into all levels of societal education by using procedures, and methods, which will profoundly affect the thinking, feeling and activity of man. The implementation of EE must not only be consistent, but it must also be natural so as to prevent the occurrence of the so-called "boomerang effect."

Concept of School Environment Education

The system of school EE has a specific central position in the entire process of forming the qualitatively new "ecological" attitudes to the environment, because the school represents the sole educational institution which with unified and compulsory attendance has systematic, long-term effect on all members of the population. It may purposefully solve the vertical follow-up of individual educational levels/grades, classes, and the horizontal coordination of EE through different subjects, of formal and non-formal education and practice, through instruction and extra-curricular activities.

Basic Elements of Environment Education

In the school and in other levels and types of institutions operating within the educational system, EE may further be developed according to a systems approach. The basic elements of EE are (1) the **project** or programme of EE, (2) the **teachers**, (3) the **pupils**, and (4) the **conditions** for EE and their inter-relations.

(1) The **project** represents the actual specification of the targets/objectives and tasks of the EE into the content and methodology of education and their formalization in pedagogical documents, i.e., in curricula, syllabi, textbooks, methodological handbooks, teaching and learning aids. (2) It depends on the **teacher** - to what extent and at what level he will implement the EE project in his pedagogical work. He is thus the decisive factor in the implementation of EE. (3) The **pupils** are the object of education; it is natural that their interests, mental level and responsibilities, requirements and relations towards the environment must be projected into the entire preparation for and implementation of EE. (4) The **conditions** for EE are given by social, regional, professional and other needs and approaches, and are implemented significantly in the process of the practical implementation of EE.

The analysis of the basic elements of EE and their interrelations constitute the basis for the detailed specification of EE in schools of all types and levels, as well as at the level of secondary technical schools.

It is evident from the above brief and simplified definition of the basic elements of EE in the school that the **first step in EE implementation must be the detailed specification of the EE project or programme, with respect to the prevailing conditions and requirements of EE, and with regard to the teacher and pupils.**

The **detailed specification of the EE project** will also apply the systems approach. The basic elements will then be: (a) **objectives**/tasks of EE, (b) **content** of EE, (c) **methods** of EE and (d) **pre-requisites** for EE in the school.

The objectives are decisive for determining; the content which may be implemented, using diverse means under the given conditions; EE methods include various verbal and practical instruction methods which are combined and used in different organizational forms of instruction in the classroom, in laboratory work and in direct contact with the environment, i.e., during thematic excursion.

The most important methods with regard to the objectives of EE are activity oriented methods which stimulate speculation, draw conclusions, develop interest, and motivate the pupils towards forming positive attitudes to the environment.

Important prerequisites of EE implementation first of all include (1) the establishment of sufficient space in the educational structure for knowledge and activities important for

EE, i.e., for including complex subjects into syllabi and special themes into curricula. The said prerequisites also include (2) a suitable environment for EE, (3) the character of the pupils, (4) the level. The objectives of schools of different types and levels must be coordinated in the EE system and must take into consideration their relations to the outside world.

The detailed specification of the EE system should at all levels and types of schools, solve the following problems:

(a) The inter-relationships of the different components of EE with all elements of the educational structure.

(b) The incorporation of detailed and intricate issues in the form of independent units with adequate time allocation.

(c) The specification of appropriate teaching strategies which aim at the management of environmental problems.

(d) The classification of inter-subject relations, school impact and linkages of the different levels both within and without the school education.

(e) The preparation of teaching/ learning aids for EE.

(f) The analysis and support of the use of the school's wider environment as a community learning resource.

(g) Teacher training and the training of other educational personnel on a continuing basis.

The EE System in Czechoslovakia

The EE system is based on the importance, actuality and prospective tasks of the solution of man's relation to the environment. EE is introduced in two basic stages.

Stage I: Immediate introduction of partial measures for implementation in schools of all types and levels.

Stage II: A long-term consideration with the necessary gradual elaboration with time. This includes drafts for all levels, from nursery schools through to post-graduate programmes.

EE in Secondary Technical Schools in Czechoslovakia

EE in secondary technical education is a very important component of the overall incorporation of EE in the educational system. Therefore, to understand this phase, one must look at the preceding level i.e., in primary schools. Attendance in Primary school begins at the age of six, and provides a general basic education. EE penetrates all subjects in compliance with their methods and scope. The essential aim throughout, is to provide a comprehensive knowledge of man's relations to his environment. This is introduced in different subject areas at different stages and amplified at each succeeding level.

At the Primary level, emphasis is placed on the formation of attitudes and skills and the development of correct behaviour. More often than not, learning experiences are drawn from the immediate school environment e.g. "good housekeeping".

Positions of Secondary Technical Schools in Czechoslovakia.

From Primary school, children move to three types of Secondary schools:

(a) Secondary General Education Schools /Grammar schools
(b) Secondary Technical Schools
(c) Secondary Vocational Schools

All three levels offer some scope for advancement to higher education but essentially secondary technical school graduates take jobs as middle technical and economic personnel, whilst at the vocational level, the students are trained in skilled workers' occupations.

The importance of EE at secondary technical schools is mainly linked with:

- the level of mental maturity reached by the pupils
- the position of secondary schools in the educational structure.

Pupils are in the age range 14 - 18. The person at this age is intensively aware of his individuality and self-awareness. The critical attitude to his environment grows, as well as his interest in the current problems of society.

The structure and concept of secondary technical schools seeks to:

1. provide students with general education
2. prepare students for involvement in practical life
3. prepare students for higher education

Environmental education must ensure

1. The formation of the civic aspect of attitude to the environment which will influence the way of life in relation to the environment.

2. An influence on professional relations to the environment. There is however, no dividing line between civic and professional attitudes to the environment. Both are formed in the process of instruction in different subject areas as well as overall educational impact of the school on its community. Teachers and instructors therefore play a very important role in this process.

Basic tasks of EE in Secondary Technical Schools

1. To ensure the follow-up of EE on primary education.
2. To incorporate EE in general education subjects.
3. To complete education with comprehensive, and complex ecological information.
4. To incorporate EE in specialized technical subjects.
5. To complete comprehensive specialized technical information on relations of the students chosen field to the environment.
6. To implement EE in the overall impact of the school and its relations.
7. To implement EE in the follow-up between the school and the outside world.

Follow-up of EE in Secondary Technical Schools on EE in Primary Schools

EE in Primary education penetrates all subjects covering essentially man's relations with his environment. Detailed knowledge of EE activities at this level is important for incorporation at the Secondary Technical schools.

EE in Basic Pedagogical Documents Concerning Technical Schools

The pedagogical document "Concept of the Study Field" provides activities, objectives, content, methods and entry requirements for specific programmes with details in:

1. Characteristics of study field.
2. Characteristics of the context of education.
3. Methods and forms of educational work.

This document is completed with the Profile of the Graduate.

The syllabus will include subjects in three areas:

(a) compulsory - for all students
(b) elective - the student obligated to select one from several prescribed subjects which then becomes compulsory.
(c) optional - the student may/but need not/select one other prescribed subject which then becomes compulsory for the student.

The curriculum of each subject comprises two parts:

1. The concept of the subject essentially introduces the subject content.

2. Subject specification - illustrates specifications of the subject matter into individual years.

The incorporation of comprehensive ecological subject matter may be implemented either by incorporating independent subjects in the curriculum or by the incorporation of units or blocks of subject matter in selected existing subjects.

EE in General Education in Secondary Schools

The objectives are unified for all types of Secondary schools, and is aimed at inculcating knowledge, skills and attitudes in relation to man and nature; the necessity of observing ecological relations and laws and generally for the protection of the environment in the interest of man. Importantly, the means and conditions must always correspond with the content and should emphasise the following:

- incorporation of activity methods.
- emphasis on the linkage of theory and practice
- ease of regional possibilities in forming attitudes to the environment.
- updating subject matter with regard to societal relationships.
- use and deepening of inter-subject relations

Comprehensive Ecological Information in Secondary Technical Schools

The comprehensive view of man's relations to his environment at this level should be formed in three stages:

(a) clarifications and generalizations
(b) sorting and summarization - a synthesis
(c) sorting and supplementation of knowledge.

At the Technical school levels the comprehensive view is presented in the subject "Man and the Environment" and the subject includes:

(a) foundations of manifestations of life on earth
(b) ecological relationships in nature
(c) man, his social and biological substance in inter-relation
(d) current environmental problems
(e) solutions of environmental problems, possibilities.

Comprehensive Subject Matter on Man's Relation with the Environment in the Curricula of Secondary Technical Schools

The comprehensive subject matter contains the same units as the subject "Man and his Environment" and is integrated in Biology in the first year and the other subject. "The Protection of Forests and the Environment" in the second year.

In Biology, year 1 - a total 134 hours, essentially looking at the origins and manifestations of life on earth theory/ practice, is in the ratio of 105:29 hrs.

Ecological relations - theory/ practice, 18:5 hrs. "Man, his social and Biological Substance" - 13 teaching hours. The area of "Protection of Forests and of the Environment" is done in the 4th year with the ratio of theory/practice 40:24 hrs. In this subject, the following topics are covered:

1. Development of man's relation to the environment
2. Landscape ecology
3. Survey of present environmental problems
4. Problems of natural resources
5. Problems related to the development of the power industry
6. Problems related to the development of industrial production
7. Problems related to the intensification of agriculture
8. Problems resulting from the operation and intensification of forestry
9. Problems caused by man's way of life
10. Recreation and its impact on the landscape
11. Effects of structures and the operation of public amenities on the environment
12. Forest fires
13. Basic components of the environment and their protection - air
14. Basic components of the environment and their protection - water

15. Basic component of the environment and their protection - soil
16. Living nature as the basic component of the environment and its protection
17. Importance of the forest for the solution of environmental problems
18. Penal law protection concerning forests and the environment
19. Current environmental problems.

Practicals:

Cover damage caused by emissions, water management, waste disposal, recreation facilities, nature, conservation, reclamation and land amelioration.

Protection of forests from the negative effect of man. Unlawful activities, assessment, inventory and categorization of damage.

Practicals are achieved through field trips.

EE in Specialized Technical Education in Secondary Technical Schools

The basic objective may in general terms be formulated for all types of Secondary schools.

1. To acquire knowledge, skills and habits important for the active protection, molding and improvement of the environment in the process of any working activity.

2. The development of interest in environmental care and ability to take a creative approach to the solution of environmental problems in any area of human activity.

3. To inculculate professional responsibility for bearing impact on the environment in any job assignment.

4. The permeation of the ecological aspect into technical thinking and behaviour.

It was recommended that the following tasks be incorporated:

- to implement and observe ecological laws in respective fields, consistently and purposefully in a differentiated manner according to the educational possibilities of respective subject areas.

- to contribute to the formation of professional responsibility for the protection and improvement of the environment.

EE in Secondary Technical Schools in the Overall Impact of the School

The overall impact of the school, particularly in influencing of attitudes will be influenced by:

- the use and provision of inter-subject relations in EE.
- the further development of EE through elective and optional subjects.
- the further development of individual interests and abilities of pupils.
- the overall educational quality of the school environment and its surroundings.
- the overall relation of the school to environmental core subjects and to EE in general.

Preconditions for EE Implementation in Secondary Technical Schools

A UNESCO pilot project implementing EE in secondary technical schools noted that the primary prerequisite for implementation is the engagement of the teacher's interest in this field. The following forms of stimulating EE have been proven useful:

- Schooling with the participation of methodologies
- Lectures and discussions on environmental problems
- Use of short films highlighting environmental issues
- Written information

Current Practice of Implementing EE in Secondary Technical Schools in Czechoslovakia

1. Much effort has been made in the formulation of basic pedagogical documents, mainly curricula of general educational and specialized subjects.

2. Components of EE are gradually penetrating into all textbooks, teaching and learning aids.

3. The subject "Man and the Environment" is as yet to be incorporated in the curricula as an elective/optional subject in most study fields of secondary technical schools.

4. Comprehensive units concerning specific relations of the respective study field to the problems of the environment have already been incorporated in the curricula of almost all study fields.

5. Conditions are gradually being created for the work of teachers in EE methodological instructions and specialized information have been issued to this effect for teachers in secondary technical schools.

Further/Higher/Forms of EE in Secondary Technical Education

Higher forms of EE are organized at secondary technical schools, i.e., post-secondary study courses. These courses are run either within the respective secondary technical school or in special centres of technical education for secondary school students.

Various types of post-secondary study courses have been taking place since 1975 and their many graduates work in different sectors of the national economy.

Teacher Training for EE

The Personality of the Teacher in EE

Teachers or instructors have decisive influence on the implementation of EE. They give information, influence behaviour and above all act as role models. Teachers for EE must cover both specialized and methodological aspects of education. Teachers as well as pupils must be motivated and this can be facilitated by continuous exchange of information, views, experiences and cooperation with the outside world. Teacher training for EE is implemented at two levels:

1. Initial/pre-service/teacher training
2. In-service teacher training

Pre-service Teacher Training

Initial/pre-service/training is being tackled within comprehensive educational research. The model adopted came out of a UNESCO sub-regional seminar on Pre-service and In-service Teacher Training (Prig 1980), and comprises the following objectives:

(a) To incorporate EE in all subjects of teacher training.

(b) The incorporation of the comprehensive subject/subject matter of EE and the function of the teacher in EE.

(c) To incorporate EE in practical training.

(d) To develop the interest and creativity of students and teachers in this field.

In-service Teacher Training for EE

The system of in-service teacher training education for EE is gradually being introduced in compliance with the UNESCO model. Several stages are involved of which the first two are compulsory for the servicing teachers, the third is the highest form of training for EE and the fourth is a free form of self-instruction and self-education of teachers for EE.

CONCLUSION

The incorporation of environmental education in the school curriculum and teacher training of technical schools in Czechoslovakia is today a reality. The incorporation has made significant strides facilitated by an initial UNESCO project. Much has been accomplished in relation to secondary technical training at all levels and for pre-training and in-service training for teachers.

A.7.5. Case Study On Incorporation of Environmental Education into the School Curriculum and Teacher Training of Technical Schools in Jamaica

Summarised by Mr. Yogen K. Saxena

7.5.1. INTRODUCTION

Jamaica, which apparently comes form "Xaymaca", meaning the land of wood and water, the Arawak name for the island, was settled by the Spanish during the early 16th Century. With about 4000 square miles (2815,000 acres) of land area, Jamaica is the third largest of the Caribbean islands. The country is 146 miles long, has a maximum width of 51 miles and possesses 550 miles of coastline.

Industry and agriculture have contributed more to national income in the last decade, accounting for $1876.5 million of GNP in 1986. Rapid industrialization not only brought depletion of non-renewable limited natural resources of Jamaica, but also problems such as environmental pollution (water air and land), solid waste disposal, health and sanitation.

Jamaica has already recognised the importance of environmental education (EE). There was a Ministry of Science, Technology and Environment in 1984. Currently the Department of Science, Technology and Research of the Ministry of Agriculture (MINAG) is responsible for the portfolio of the Environment. There is a clear consciousness towards the protection of the environment both through formal and non-formal education.

This summary presents information with reference to the policies, programmes and implementation of Environmental Education (component/separate) courses in the Technical and Vocational Education system of Jamaica and the impact it has created in the prevention and control of environment problems in the country. The approach and methodology adopted for this report is based on content analysis of various related documents collected from different sources such as the Ministry of Education, the Ministry of Health, the Ministry of Agriculture, Teacher Training institutions, Technical and Vocational Institutes,tertiary institutions. as well as key resource personnel engaged in environmental planning and management. The analysis so obtained is reflected in various sections of the study.

7.5.2 Education System in Jamaica

The current structure of the public and private educational system in Jamaica is based on levels, ages, grades and

institutions. These are illustrated in Table 1. The various educational levels are as follows:

a) **Pre-Primary:** Pre-school or infant education in Jamaica begins at the age of 4 and is offered in both public and private institutions.

b) **Primary:** At the age of 6, children are admitted to primary schools for six grades. At the age of 11+ students are selected to enter high school. This selection for high school places is done on the basis of the students' performance in the Common Entrance Examination.

c) **First-Cycle Secondary:** First-cycle secondary education consists of grades 7 to 9 and begins at age 11+ and continues through age 14+. Public education at this level is offered in new secondary schools, and in the first three grades of comprehensive and high schools. Technical schools, however start at grade 8. Entry to the new secondary and comprehensive high schools is based on a free transfer from the nearest feeder primary schools.

d) **Second-Cycle Secondary:** Second - cycle secondary education is offered in grades 10-11 at technical, comprehensive, high and new secondary schools and in grades 10-13 of government and government-aided high schools. At the end of grade 11 in new secondary schools students are awarded the Secondary School Certificate based on assessment done by teachers and terminal examinations set by the Ministry of Education. In grade 10 students usually take the Jamaica School Certificate Examination. Students in grade 11 at high schools take the General Certificate of Education at Ordinary Level.

e) **Vocational:** Vocational education programmes are offered in technical high schools and most secondary schools. Apart from this, special vocational training programmes are offered in two vocational schools.

f) **Continuing/Community Education:** Continuing/Community Education is designed to provide the programmes which are organised to meet the needs of people who are not serviced by the formal education structures through community colleges, evening classes and non-formal education centres.

The National Literary Programme undertaken by the Jamaican Movement for Adult Literacy (JAMAL) is the biggest educational programme outside of the Ministry of Education.

g) **Teacher Education:** There are seven teacher training colleges which train teachers mainly for primary and new secondary schools. Teacher training also takes place at

TABLE 1.
CURRENT STRUCTURE OF THE EDUCATION SYSTEM

S.NO.	LEVELS	AGES	GRADES	INSTITUTIONS
1.	Pre-primary	4 - 5+		Infant and Basic Schools
2.	Primary and All- age	6 - 11+	1 - 6	Primary Schools
3.	First - Cycle	12 - 14+	7 - 9	Junior Secondary Schools
	Secondary	12 - 14+	7 - 9	Comprehensive High Schools
		12 - 14+	7 - 9	High Schools
		13 - 15+	8 - 9	Technical High Schools
4.	Second Cycle	15 - 19+	10 - 13	High Schools
	Secondary	15 - 19+	10 - 11	Technical High Schools
		15 - 17+	10 - 11	Comprehensive High Schools
5.	Vocational	15+ - 17+		Vocational Schools
	Education	15+ - 17+		Trade Training Centres
6.	Teacher Training	Entry at 17+	Pre-teacher Training	Teacher Training Colleges
		Entry at 17+	12 week Course	Caenwood Junior College
7.	Further Education	Entry at 17+		College of Arts, Science and Technology (CAST)
		Entry at 17+		College of Agriculture (CA)
		Entry at 17+		University of the West Indies (UWI)

the Schools of Education, UWI. The College of Arts, Science and Technology (C.A.S.T), the College of Agriculture (COA), the Cultural Training Centre (CTC) and the Excelsior Community College.

h) **Tertiary Education:** Further education is offered mainly at seven teacher training colleges, College of Agriculture, the Cultural Training Centre, the College of Arts, Science and Technology, the University of West Indies and in certain areas at the Brown's Town, Knox and Excelsior Community Colleges.

7.5.3 ENVIRONMENTAL EDUCATION AT SCHOOL LEVEL

Environmental Education (EE) in Jamaica is not taught as a subject at the school level. However, the curriculum of social studies and science include content related to the environment.

7.5.4 TECHNICAL EDUCATION AND TEACHER TRAINING

A. Technical Education

Background

Major achievements in the development of technical education in Jamaica took place over the last 20 years and has made a significant contribution to the development of Jamaica.

1. **Objectives of Technical Education**

The objectives of technical/vocational education in Jamaica as stated in the Five Year Educational Plan (1978 - 1983) of the Ministry of Education are as follows:-

i. to incorporate introductory experience in Technical/Vocational education for all students.

ii. to develop basic knowledge and skill leading to vocations.

iii. to develop basic knowledge and skill leading to tertiary level technical education.

iv. to expand the provision for the training of teachers in-service programmes for technical/vocational teachers.

v. to provide the co-ordination of technical and vocational education at the national level.

2. **Levels and Duration of Schooling**

a) At the Certificate level, in technical high schools the duration of training for certification is four years. The duration for craftman training at the Vocational Technical Development Institute (V.T.D.I) for various courses is one year. The College of Arts, Science & Technology offers technical courses of 2 and 3 years duration through part-time/full-time and evening studies.

b) At the diploma level, CAST offers technical courses of 3 years duration.

c) At the degree level, CAST offers post diploma studies, leading to the Bachelors in Engineering through part-time/evening studies.

3. **Enrolment**

The enrolment in the various institutions for the years 1983 - 1987 are given in Table 2. Table 3 gives the enrolments for technical training graduating groups for various areas.

4. **Decrees, laws, rules and regulations requiring the incorporation of EE in the curriculum.**

Currently in Jamaica there are no specific laws, rules, or regulations requiring the incorporation of environmental education in the curriculum of technical and vocational education.

B. Teacher Training

1. **For General Education**

There are seven teacher training colleges which train teachers for primary and secondary schools. The course lasts for 3 years, the final year being an internship placement in a school or college.

Teacher training also takes place at:

- University of the West Indies
- College of Arts, Science & Technology (CAST)
- College of Agriculture
- Cultural Training Centre (CTC)
- Excelsior Community College

There are no specific local training programmes for certification of the following categories of school personnel:

- principals and vice-principals
- teachers with specialiozed training for primary education
- heads of departments of secondary schools
- school counsellors.

There are however, local training programmes for teachers for the handicapped and children with learning disabilities and emotional disorders.

2. **Vocational and Technical Education**

The Vocational Training Development Institute was established in 1970 as an integral part of a national industrial training programme.

Training at the VTDI is offered through full-time and part-time (itinerant evening and summer schools) programmes and is provided for:

a) Job Instructors - those who will instruct trainees in the specific skills, facts and attitudes of the job or occupation.

b) Related Subject Teachers - those who will instruct trainees in mathematics, english language, technical drawing and other related subjects. VTDI also offers vocational training to upgrade the skills of the workman in industry in the areas of automotive mechanics, construction, mechanical and electrical trades. Training may either be conducted at the plant/industry or carried out at VTDI workshops.

3. **Technical Teachers Education**

The CAST 3-year diploma programme in Industrial Technology Education prepares students to become technical teachers in secondary level institutions and to further their education through degree programmes at CAST and elsewhere.

Three years of specialization are offered, namely:

- Electrical Technology
- Construction Technology
- Mechanical Technology.

TABLE 2.

ENROLMENT IN THE TECHNICAL INSTITUTIONS IN JAMAICA

Name of School/ Institution	No. of Schools	ENROLMENT								
		1983 - 1984			1984 - 1985			1985 - 1986		
		Male	Female	Total	Male	Female	Total	Male	Female	Total
Technical High	7	3976	4000	7676	3990	3866	7856	4088	4139	8227
Vocational and Agriculture	3	304	228	532	241	213	454	205	220	425
CAST	1	1820	1635	3455	1767	1441	3208	1727	1748	3475
College of Agriculture	1	---	---	185	---	---	204	--	---	199

TABLE 3.

TECHNICAL TRAINING GRADUATING GROUPS ENROLMENTS
MINISTRY OF EDUCATION

GRADUATING GROUPS FOR 1983-84-85-86 & 87

DEPARTMENT ENROLMENT	SEX	NO.	TOT.	NO.	TOT	NO.	TOT.	NO.	TOT.	NO.	TOT.
ARTS & CRAFT	MALE	7	19	16	25	4	19	9	10	10	11
	FEMALE	12		9		15		1		1	
BUS./COMM-ERCE	MALE	18	79	15	88	17	74	22	98	19	75
	FEMALE	61		73		57		76		56	
HME ECONOM-ICS	MALE	3	34	2	59	1	38	-	67	-	33
	FEMALE	31		57		37		67		67	
BUILDING TRADES	MALE	21	22	11	14	8	12	13	15	15	16
	FEMALE	1		3		4		2		1	
ENGINEERING	MALE	41	44	76	80	40	46	44	51	44	54
	FEMALE	3		4		6		7		10	
ELECTRONICS	MALE	39	39	13	17	36	40	30	32	38	39
	FEMALE	-		4		4		2		1	
TOTAL		237		283		229		273		228	

7.5.5 THE ENVIRONMENT EDUCATION COMPONENT

Environment Education Objectives

1. Technical Education

The main aim of Technical and Vocational Education is to train technical man power depending upon the type, kind, number etc. The trained personnel are expected to have skills and knowledge of professional requirements at a particular level depending upon the training. On the other hand, they must have a required basic knowledge of energy management, industrial safety, sanitation and hygiene.

The various programmes of education and technical training offered in many developing or under-developed countries largely meets the former requirements or objectives where as they are lacking in the later, "the environmental component". Jamaica realized the importance of problems due to pollution of water, land and air but is still not aware of the importance of incorporating components of EE education into the primary, secondary, and tertiary level education system. In relation to the objectives and guiding principles for environmental education it is important to make a distinction between the concepts "Education and Training".

Environmental Education is generally applicable to the education of all citizens and should be directed at people in all ages, types and categories of formal education - pre-school, primary, secondary and tertiary. Where as training is applicable to special groups of persons e.g. specialists and technicians.

The school graduates of grades 1 - 9 have very little knowledge of "man and his environment". Particularly grade 7 has no input and very little is taught in grades 8 and 9.

Thus, the graduates who enter into the secondary and tertiary level of technical and vocational education have no idea about their responsibilies towards the preservation of the environment. More specifically the situation with respect to the various levels of institutions/colleges in Jamaica is as follows:

a) **Technical High Schools**

The objectives of the curriculum place emphasis on industries and other employers needs. The general core subjects such as Science, Biology, Geography and Social Studies have some inputs of general aspects of the environment.

b) **The Tertiary System**

The primary purpose of Certification and Diploma level technology courses is the training of middle level and shop floor supervisors for manufacturing/processing and engineering industries. The curriculum of courses at CAST and College of Agriculture are lacking in terms of EE objectives. The diploma courses in Physical Planning and Chemical Technology at CAST have environmental topics and are taught in depth.

The details of EE component for these courses are as follows:

i. **Physical Planning Technology**

- Understanding of geographical patterns and processes in Jamaica
- Man's role in controlling the direction of growth
- Basic concept of land (not for indiscriminate use)
- Human settlements to proper physical planning
- Urban functions and public works planning
  - . solid waste systems
  - . sewage storm water disposal
  - . water distribution

ii. **Chemical Technology**

a) **Environmental Chemistry**
- . Introduction to local environmental problems
- . Characteristics of water and waste water
- . Sampling and treatment of water
- . Air pollution
- . Treatment and disposal of garbage.

b) **Pollution Control**
- . Environmental criteria and standards
- . Jamaica's environmental problems
- . Water and waste water analysis
- . Industrial waste water control
- . Environmental management.

c) **Water and Waste Water Treatment**
- . General aspects of water
- . Water treatment processes
- . Conventional treatment methods
- . Legislation and regulations.

2. **Teacher Training**

Environmental Education (EE) is not a part of the curriculum of teacher training but sufficient related topics are covered in the science syllabus.

In the Technical Teacher Education Department at CAST Environmental Education (EE) is not a part of the 3 year curriculum however some areas are reflected in the curriculum.

7.5.6 Major Achievements in the Incorporation of Environmental Education Components

Environmental Education is not a part of the curriculum in Technical and Vocational Education System in Jamaica. No doubt, the present syllabuses in different curricula of Technical and Vocational courses create a consciousness for a sustained environment, although the effect of these cannot be directly evaluated.

The Incorporation of Environmental Education in the school curriculum of technical high schools and technical and vocational education in Jamaica will increase the awareness and influence of environment on the daily life of Jamaicans. But achievement of the intent of Environmental Education (EE) will depend upon the following:

1. Government policies on environmental protection
2. Pressure from industries as well as public, professionals, and professional organizations
3. Available resources. Supportivwe assistance from International organizations such as, PAHO, WHO, UNESCO, UNEP, etc.

7.5.7 Major Constraints Encountered

There areno major limiting or constraining factors for the incorporation of environmental education in the curriculum of technical and vocational and agricultural education in Jamaica.

Some of the problems encountered are:

1. Lack of laboratories, facilities and equipment in the technical high schools and other institutions.
2. The absence of a National Science or Environmental Policy.
3. Multidisciplinary nature of Environmental Education and variations at different levels: At the primary and secondary level the Environmental Education emphasis should be on awareness and understanding, whereas at tertiary level it should emphasize control and assessment studies.

4. Lack of Environmental Education component in teacher training: It will be better to train the teachers first and then incorporate EE into the school curriculum, as there is a shortage of trained teachers in Jamaica.

5. The absence of rules, laws and regulations for the incorporation of Environmental Education in the Curriculum.

7.5.8 RECOMMENDATIONS FOR INCORPORATION OF ENVIRONMENTAL EDUCATION INTO INDUSTRIAL EDUCATION

1. The Ministry of Education, the Ministry of Youth and Community Development and the Ministry of Agriculture should prepare guidelines and working documents for the incorporation of Environmental Education at school level and technical and vocational institutions.

2. Tertiary institutions such as CAST, must include Environmental Education components in their curricula to an extent, depending upon the specific needs of the course.

3. Curriculum for teacher training must add an additional course on Environmental Education especially with respect to the technical teacher's training done at CAST and VTDI.

4. The emphasis of Environmental Education should be based on case studies and projects related to local environmental problems and issues.

5. Curriculum should achieve the objectives based on the needs.

6. The scientific community of Jamaica should assist with writing and production of teaching materials which can be used in general, and specialized course.

7. The Ministry of Education should seek help for the preparation of teaching manuals, etc. from organizations such as FAO, UNEP, UNESCO and UNDP.

8. IEEP should encourage the exchange of information on the incorporation of Environmental Education at least among the Caribbean Countries as part of their network on information exchange.

9. Various institutions including CAST played an active role in environmental awareness in the recent past. NGO's also organized conferences, symposia and seminars on

Environmental matters. The same should be encouraged and financed through Central and Local Government, or international organizations.

10. The Ministry of Agriculture, currently responsible for the environment is planning to set up a National Environmental Institute. This could be funded through UNESCO or UNEP, and INFOTERRA of UNEP and should provide sufficient literature for this or similar type of institutes in Jamaica.

11. Documents on general guidelines, objectives, concepts of Environmental Education, course structures, syllabuses, National/International directories, resource books on Jamaican Environment should be prepared through a single national effort involving the Ministry of Education, the Ministry of Agriculture and other agencies, or with the assistance of international organizations.

7.5.9 **Conclusion**

There is a need for the incorporation of EE components in the curricula of Technical and Vocational Education (TVE) in Jamaica. The recommendations of the Inter-Governmental Conference on EE at Tbilisi, (USSR) should be taken seriously and implemented in Jamaica. The Government of Jamaica has to play a vital role for the planning and implementation of these objectives.

Appendix 8 - SUMMARY OF COUNTRY REPORTS

8.1 Antigua

8.2 Barbados

8.3 Cuba

8.4 Dominica

8.5 Grenada

8.6 Guyana

8.7 Jamaica

8.8 St. Lucia

8.9 St. Vincent and the Grenadines

A.8.1 **ANTIGUA:** Summary by Eustace Hill

1.0 Introduction

The twin-island state of Antigua and Barbuda has a population of nearly 80,000 persons living on a land mass of about 180 square miles. More than 75,000, however, reside in Antigua on about 108 square miles. For this reason, most of the discussion in this paper will address the environmental issues of Antigua.

Presently, Antigua and Barbuda boasts, and rightly so, of being the most rapidly developing country in the region; 7% GNP increase over the past year. This rapid development is the product of a boom in both the tourist and construction industries. The tourist industry, in particular, has been responsible for great disparity in employment with respect to other sectors, notably agriculture. The end product is that most workers gravitate towards the lucrative tourist industry at the expense of agriculture and related fields. Regrettably, though, this gravitation of workers to the tourist industry and the construction boom occasioned by the construction of hotels and local housing has improved the life-style of an expanding populace, and has had significant negative impacts on the environment. There is probably no other period in Antigua and Barbuda's development where the need for the management of the environment is more crucial and where the incorporation of Environmental Education (EE) in both formal and non-formal education would be more apertune and potentially impacting.

This paper identifies deforestation, land pollution, beach erosion, and marine pollution as the major environmental problems affecting Antigua and suggests that the lack of effective policy and planning are the major causes for these problems. Mention is made of the work of a few agencies, namely, the Ministry of Agriculture, the Ministry of Education, the Historical, Recreational Sites and Conservation Commission and a newly formed group operating under the auspices of the Caribbean Conservation Association (CCA). Although the curriculum in industrial schools, namely, the Hotel and Training Centre, the Antigua State College and the Non-Formal Skills Training Centre, deal with issues related to their immediate environment; however, a holistic appreciation of the wider environment is lacking. In the Antigua/Barbuda context, sensitising policy-makers and the public is by far the most pressing need required to bringing about corrective action in the care and management of the environment. However, education both formal and non-formal, cognitive but more importantly the affective, supported by legislation and enforcement is necessary. Thus, the strategy for incorporation of EE in industrial schools and teacher training should involve its infusion in existing subjects as well as forming part of a wider general knowledge programme.

2.0 MAJOR ENVIRONMENTAL PROBLEMS IN ANTIGUA

The major environmental problems facing Antigua today are:

1. Deforestation
2. Land Pollution
3. Beach Erosion
4. Marine Pollution.

Deforestation

Deforestation in Antigua is perhaps, one of the most acute in the Caribbean. The effects are evidenced by:

a) excessive siltation of reservoirs and ponds due to soil erosion

b) unusually hot days and almost immediate evaporation when it rains

c) reduced beauty of the landscape

The main causes of deforestation are:

a) decline in agriculture

b) bush fires

c) unplanned clearing of land; and

d) roaming livestock.

Methods of re-afforestation include the planting of local and foreign species of trees, and the revival of the Arbor Day.

Land Pollution

Littering and overcrowding in the Greenbay/Grace Farm area is the major cause of land pollution. Although the Litter Act has been passed and rubbish bins can be seen all over the city, there is need for Antigua to appoint Litter Wardens with power of arrest.

Beach Erosion

The main causes of beach erosion are identified as:

a) dredging

b) sand mining

c) destruction of coastal vegetation and mangrove swamps

d) improper location of buildings

Although sand mining is being monitored in Antigua, it however persists in Barbuda. Some hotels have effective programmes to control beach erosion, but, there is need for a national policy with respect to beach care and management.

Marine Pollution

The major cause of marine pollution is the disposal of sewage into the sea and the consequent destruction of coral reefs. There is generally a lack of effective monitoring of sewage disposal from hotels.

3.0 Current Industrial Programmes in Antigua.

The current industrial education programmes in Antigua are operated at a number of levels

a) Antigua State College

b) Hotel and Training Centre

c) Non-formal Skills Training Project

d) Antigua and Barbuda Technical and Vocational Centre

Industrial programmes at the Antigua State College are conducted by the Engineering and Commercial Departments, while the Teacher Training department prepares persons to teach in the primary schools. The Hotel and Training Centre presently has two programmes, one at the basic or craft level and another for persons at the middle management level. The non-formal Skills Training Project (STP) trains persons for industry. The goal of the STP is to improve the employability and income of the unemployed and youths. The Antigua and Barbuda Technical and Vocational Centre offers courses in Carpentry and Joinery, Electrical installation, Construction and Automotive Mechanics to post primary students on a day release basis.

4.0 **The Environmental Dimension of Industrial Education**

Whether students graduate from the Antigua State College or from the primary schools, it is evident that they are part of three

environments, namely

a) The immediate environment - classrooms, butcher shops, etc.;

b) The wider immediate environment of the institution;

c) The even wider environment of the island and the world.

Inspection of the various curricula has shown that most programmes are careful to address the problem of functioning in the immediate working environment, but that the impact of the student on the environment as a person and as a technician is often omitted. This omission needs to be corrected.

5.0 Priority Needs and Suggested Possible Measures for the Incorporation of EE in Industrial Schools

1. A national policy on environmental education.
2. A ministry charged with the responsibility of the Environment.
3. A CARICOM Meeting for Ministers responsible for EE.
4. Special workshops and seminars on EE for various interest groups.
5. The establishment and coordination of linkages between ministries to deal with environmental problems.
6. Reviewing and upgrading of existing syllabuses to highlight specific problems like de-afforestation.
7. Sensitizing of the public towards care of the environment.
8. Analysis and careful documentation of environmental problems in Antigua, their types, causes and how to prevent them and the cost of not preventing these problems.
9. Preparation, dissemination and utilisation of modules on EE.
10. Training of teachers, administrators and parents on EE issues.

6.0 Suggested Strategies for the Incorporation of EE in Antigua

1. In those situations where the programme is flexible, it is advised that EE be made a part of a general knowledge course.

2. In those areas, e.g. Secondary Schools, where the syllabuses are less flexible, teachers should be trained to infuse EE into the existing programmes.

Conclusion

The end product of EE must be the care of the environment, not just knowledge about caring the environment. This requires both political and personal commitment. The author is convinced that ignorance at all levels, not negligence, is the main problem facing Antigua with regard to the care of the environment. If the information in this paper proves to be of value, it is hoped that these suggestions will help to contribute towards a more beautiful Antigua and Barbuda.

A.8.2 **BARBADOS:** Summary by Roger Marville

In recent times, the Educational System has been charged with the mandate to produce a more skilled labour force. Essentially, this means that the responsibility will lie with the Schools which will now have to consider training modes in addition to their academic modes.

A document entitled "A proposed curriculum for Industrial Arts Education at Junior Secondary State" is now the official policy for Barbados in this area and leads to the Barbados Secondary School Examination.

It is interesting to note that no mention of any environmental concern is addressed in the curriculum for Industrial Arts and this omission still exists today, even with the coming on stream of the Caribbean Examination Council's programme.

It is fair to say that beach erosion has received a good measure of publicity and should be uppermost in the minds of the communities, especially those in coastal areas. Other worthwhile efforts remain within Government Departments or the private sector and have received limited circulation.

The fragmentary state of environmental education does not seem to be a major concern at this time. The implication is that minimal efforts being expended are viewed with passing concern. Until such time that coordination and cooperation of programmes and projects become a priority for those responsible for environmental education, that thrust in the area will continue to be superficial.

The value of Environmental Education (EE) for an Industrial Arts programme is necessary. However, the implementation will call for training and retraining of teachers, flexibility in the administration of industrial schools and a high level of coordination and cooperation among those involved.

Non-technical aspects of the Industrial Arts programme are done by the Erdiston Teachers' Training College. This common core of subjects is taught quite independently of the trainee teachers specialism and is largely, if not totally, determined by the requirements of the University of the West Indies, (UWI), Faculty of Education.

Unfortunately, there is little coordination between the tutors. Consequently, the pedagogy is not linked to the specific needs of industrial arts teachers.

Developing countries, and to some extent, developed countries are begining to pay closer attention to the Environment. This

is a recent phenomenon. Developing countries striving to get into the industrial age with all the attendant problems, are unlikely to consider environmental concerns. The manufacturing sector faced with the high cost of imported raw materials and equipment, using an unskilled labour force to produce high quality products for very competetive markets is unlikely to further frustrate the efforts by incorporating environmental measures into its systems.

The legislation, outdated as it is, was never truly enforced even at a minimum threshold level because there were, and still are, no standards that could be applied. Even if international standards were adopted, there would be no specialists or equipment to measure the level of harmful substances affecting the environment.

Strategies to be considered in the incorporation of environmental education in industrial schools are likely to include:

1. Teacher training;
2. Restructuring of programmes in industrial schools;
3. Formulation of manageable environmental programmes;
4. Direct involvement of Government and private sectors;
5. Sensitization of the community;
6. Convening of a broad-based advisory committee on EE;
7. Implementation of an in-service teacher training programme;
8. Formulation of appropriate environmental standards;
9. Promulgation of legislation.

There must come a time in small developing countries that public awareness of environmental issies is such as to fuel the effort required to sustain various programmes and projects.

In Barbados, the Town and Country Planning Department which has maintained a long-term planning approach in terms of its zoning policy, is to be complimented. This policy, which is essentially a land-use policy, strives to prepare an Environmental Impact Assessment prior to the establishment of industrial estates.

A.8.3 **CUBA:** Summary by Rolando Martinez

In keeping with the consciousness of the delicate and important mission that it is to influence the attitude of men toward nature, with a long range vision and a scientific base, our Government, by means of the Ministry of Education, the mass media (radio, television, newspaper, etc.), the political and mass organizations and others, have been working in this essential direction of forming the personality of our citizens.

Within the National System of Education the introduction of a special Environmental Education into Technical and Vocational Education is particularly necessary for two main reasons:

1) They have an important part to play in development and production processes that exert maximum impact on the environment and they give their opinions and make important decisions.

2) They are frequently the most affected by environment, as well as by risks and accidents inherent to their work places.

The work done in the introduction of E.E. into the different specialties of Technical and Vocational Education, has been aimed mainly toward the student's protection against the risks that could cause accidents; to enhance the knowledge and use of the technical patterns related to their work and to the saving of resources (energetics, raw materials, oil, etc.).

The use of the Study-Work principle and the fulfillment of the Pre-professional Practices in which our students take part, make possible their placement in production and services centers, where they are in direct contact with all the interfaces of the environment that they will encounter when they become workers.

There are other general trends and activities, that put them in contact with environmental problems. An area of first need is the qualification and preparation of the teachers that will have responsibility for the teaching of the mid-level technicians.

For this, the Pedagogical High Level Institute for Technical and Vocational Education is developing a project of syllabuses with experimental bases, that has two parts. The first one with four themes common to all specialties that are developed in the selected sample, and the second one, directly related to four subject areas that belong to the specialties of Electroenergetics and Buildings.

As a result of this work we intend to obtain an E.E. Syllabus and supporting materials for the preparation of high level teachers for Technical and Vocational Education, the application of which will improve individual and collective conscience with respect to environmental protection.

A.8.4 **DOMINICA**: Summary by Franklyn Zamore

Introduction

The protection and improvement of man's environment can be quite an intricate problem. The task of fighting the pollution of the atmosphere and waters is coming very much to the foreground today.

In Dominica, due to limited industrialization, we have been spared disease and death caused in the more developed countries as a result of the ejection of toxic substances by industrial enterprises and by transport vehicles. We are also to some extent, spared of the formidable danger posed by contamination of the atmosphere with radioactive fall-out resulting from thermonuclear accidents and explosions caused by air currents over long distances. But there is a great deal of pollution in Dominica from which we are not spared and which we are in a position to control.

For example, our atmosphere continues to be contaminated by dust, carbon dioxide, soot, pesticides, noise, among others. All these, if left unchecked can affect our country adversely. Pollutants can also be dangerous to human health.

Even more relevant to us is the pollution of our waters. Water is not only a resource of economic value but also a basic component of our natural environment. We are blessed with many rivers, yet the incidence of typhoid in Dominica is the second highest in the world. Environmental education can lead to the improvement of the quality of our natural resources and the effective control of their pollution and is crucial to the improvement of life in Dominica.

Natural disasters, for example, volcanic eruptions, earthquakes, seaquakes, droughts, floods, hurricanes, soil erosion and other such phenomena are caused by natural processes occurring in the environment irrespective, of human activity.

Dominica is, unfortunately, not free from natural disasters. This is evident from the volcanic activity in our island, the earthquakes, soil erosion, and especially hurricanes. Because of the great deal of natural damage these disasters cause to our country, it is absolutely necessary for us to have a deeper understanding of the need for measures to forecast and guard against natural and man-made disasters. In Dominica there is need for Environmental Education.

MAJOR ENVIRONMENTAL PROBLEMS

The environmental problems that are of concern in Dominica are:

(a) Marine and fresh water pollution;

(b) Refuse disposal;

(c) Preservation of wild-life;

(d) Land maintenance;

(e) Use of pesticides and weedicides;

(f) Air pollution - soot, noise, dust, spray oil, sulphur fumes;

(g) Illegal hunting;

(h) Deforestation;

(i) Water catchments.

The last three problems are the most critical and will be looked at more closely.

Deforestation

In Dominica, uncontrolled clearing of the forest lands for agriculture and the clearing of vegetation along roadsides, as well as on steep slopes pose a serious problem to the natural environment. This action constitutes a threat to life, property, and the financial resources of the country.

Solution and Prevention

(1) Maximum use is now being made of existing agricultural lands to negate the need to open up virgin forest lands.

(2) Re-afforestation is now stressed as a pre-requisite to any felling of timber. A programme of reforestation is being planned.

(3) Marginal lands not being used in an effort to prevent further degradation of such lands and to make them economically productive.

(4) Public education and awareness programmes should be strengthened, so that everyone can be educated about the value of trees, that the public will have better appreciation and more respect for standing trees.

(5) Greater coordination between agencies in planning and implementation of EE should be stressed and greater supervision provided.

(6) Environmental programmes should cater for the identification of trees.

(7) A drive to landscape populated areas by planting trees for beautification, shade and food where applicable, should be implemented.

(8) Laws should be passed to stop persons from the indiscriminate cutting down of trees along roadsides, on steep slopes, in coastal areas and generally populated areas. These laws should cover Government as well as private lands.

(9) Forests extension should be strengthened and forest officers be informed. These officers should make their presence felt in the community in which they work by regularly visiting schools and speaking to community groups. The use of community bulletin-boards should also encouraged.

Hunting

In Dominica, indiscriminate hunting of wild-life has led to the depletion of many species, for example, our Sisserou Parrots, Manicou, Argouties, Land Crabs, and fresh water fish. In the mid 70's parrots were being smuggled into the neighbouring French Islands of Gaudeloupe to the North and Martinique to the south, for as much as 2,000 francs each.

Prevention

In 1976 the Ministry of Agriculture recognised the threat and enacted the Forestry and Wild-life Act #12, which gave Government protection to endangered species of wild-life and trees of the rain forest.

The legislation is now being strengthened to remove existing loop-holes, and to deal particularly with the storage of frozen wild-life. It has been suggested that more research should be conducted in the areas of wild-life breeding, feeding habits, and habitat to facilitate more effective management of the wild-life stock.

Water Catchments

We recognise the serious effects that deforestation and cultivation of water catchments can have on the supply and quality of water used for domestic and other purposes. It is also recognised that without adequate protection of the catchments, the majority of which are situated on private lands, the problem can escalate to gigantic proportions, and lead to serious social consequences.

To overcome this problem, legislation has been enforced to bring all water catchment lands under the jurisdiction of Government. Because of the national importance of these water catchments, it is felt that: no effort should be spared to protect water catchments. Government should explore opportunities for acquisition of lands; immediate reforestation of water catchments and river-banks be undertaken in critical areas; serious public education and awareness of the significance of water catchments be actively promoted in schools.

CURRENT INDUSTRIAL EDUCATION PROGRAMME

In Dominica, Industrial Education is confined to the Clifton Dupigny Community College and more recently to a few pilot projects funded by the World Bank.

At the Technical College the curriculum is tailored to meet the needs of our growing industrial sector, by preparing local students for external examinations, for example, City and Guilds, and to provide them with a marketable skill so badly needed for self-employment. The College offers a wide variety of courses in both technical and academic disciplines. The programmes included for City and Guilds examinations are:

(1) Electrical Mechanical Technician

(2) City and Guilds Electrical Craft

(3) City and Guilds Electronic Craft

(4) Electrical/Refrigeration sandwich course

(5) Carpentry and Joinery course

(6) City and Guilds Building Technician

(7) A craft course in Plumbing

(8) Agriculture

The junior secondary school project organised by UNESCO, and the Ministry of Education is sponsored by the World Bank. The main objective of this programme is to introduce primary school students to technical subjects, so that those who eventually get accepted to the Technical College will have already been familiarized. At the junior secondary school level, students are introduced to engineering drawing, metal work, safety, woodwork, electronics, electrical wiring, among others. The project is to be fully implemented in the not too distant future.

In closing let me stress that Dominica is among the countries that can still boast of a relatively pollution-free environment,

but if present trends in the attitude of the masses toward the environment continue, that boast will soon be eclipsed by severe environmental problems.

In Dominica we understand that the best place to start Environmental Education is in the schools. It is during the formative years that children develop their life-long attitudes. Consequently, it is imperative that at an early age, children be exposed to healthy environmental practices and that they develop an appreciation and respect for the environment of which they are an integral part.

A.8.5 **GRENADA:** Summary by Joan Elizabeth Henry

INTRODUCTION

In recent years, Grenada's Government through the Ministry of Education, Culture, Sports and Youth Affairs, the Ministry of Agriculture, Tourism and External Affairs, and the National Science and Technology Council have been placing a certain amount of emphasis on Environmental Education with a view to:

(a) Preserving the natural and cultural heritage of the island;

(b) Encouraging public understanding, appreciation and use of that heritage so that it can remain intact and unimpaired for future generations;

(c) Guaranteeing economic and social benefits for the Grenadian people.

In light of this, the Organization of American States Integrated Development Project and the Government of Grenada have formulated plans and policies which are aimed at achieving the following objectives:-

(1) Land use defining;

(2) Formation of National Parks and Protected Areas Programme;

(3) Protection of watersheds and important ecosystems;

(4) Promotion of cultural and natural attractions, and;

(5) Development of tourism and educational programmes.

The work done in the areas of land use and zoning, natural parks, resource conservation and tourism development are part of an on-going assistance to Grenada by the Department of Regional Development.

It is hoped that the information that is collated by the programme will be of use not only to Grenada but to other Caribbean territories as well.

In an effort to promote Technical and Vocational education in Grenada, the Ministry of Education formulated a policy which sought to provide a conceptual framework and operational pattern for technical education.

The Ministries of Education, Agriculture, Health and Tourism, along with the Grenada Science and Technology Council recognize the need for including environmental education as part of the curriculum of both secondary and tertiary institutions, in addition to local industries and the wider society.

1.0 Grenada's Major Environmental Problems

The major environmental problems of Grenada are:

1.1 Soil Erosion

Causes : Deforestation and careless land use.

Corrective Measures : Formation of land-use policies. Reforestation and an education campaign.

1.2 Coastal Erosion

Causes : Man's activities and shoreline development.

Corrective Measures : Policies on shoreline development are being put in place.

1.3 Damage to Reefs

Causes : Deforestation, siltation, sewage disposal and dumping of nutmeg shells.

Corrective Measures : The deforestation problem is being worked on, This will assist in solving the siltation problem. The sewage disposal will have to be tackled.

1.4 Reduction of Water Supply

Causes : Extensive deforestation especially around the Annandale watershed.

Corrective Measures : Management policies are now in place. Purchasing of privately owned estates in the area by Government, so that they can be managed.

1.5 Depletion of Fisheries

Causes : Destruction of mangrove swamps, Sedimentation; Dumping of nutmeg shells.

Corrective Measures : Management policies for the use of mangrove swamps.
Alternative uses of nutmeg shells.

1.6 **Solid and Liquid Waste**

There is growing concern about the build-up of plastics, tyres, paint waste, foam from "prefab" construction, and nutmeg shells.

Corrective Measures : Alternative uses, disposal and recycling are being considered.

It is important that the public be made fully aware of the country's environmental problems and solutions. An education campaign has been implemented in Grenada through the Science and Technology Council.

2.0 **CURRENT INDUSTRIAL EDUCATION PROGRAMMES**

A policy has been formulated to provide a conceptual framework and operational pattern for technical education in Grenada. Some of its objectives are:

(a) to offer technical education in the curriculum of two all-age schools;

(b) to introduce pre-vocational technical education in secondary schools;

(c) to train teachers;

(d) to upgrade the Technical and Vocational Institute to offer higher levels of training;

(e) to develop new curricula to meet the TVE needs of the students.

At present, TVE is restricted to the Technical and Vocational Institute, the St. Davids Technical and Vocational Centre, and the Youth Skills Training Centre, although a pilot project has been introduced in two secondary schools and some primary schools do woodwork.

The courses offered at these institutions are:

Technical	**Vocational**
Automotive Mechanics	Typing
Refrigeration	Accounts
Electrical	Business Studies
Woodwork	
Metal Work	**Academic**
Drafting	Language
	Mathematics

In addition, the Youth Skills Centre offers courses in:

- Plumbing and Pipe fitting
- Industrial sewing
- Electrical installation; and
- Automotive Mechanics

EE is not included as a part of any of these courses.

3.0 THE ENVIRONMENTAL DIMENSION OF INDUSTRIAL EDUCATION

Every individual should be interested in his or her environment, especially those who are involved in manufacturing. They should all begin to think in terms of the effects on the environment of their waste products. What happens, usually, is that they see their solid and liquid wastes as somebody else's problem.

It is important therefore to include Environmental Education as part of the curriculum in technical schools as well as in seminars and workshops for the business sector which deals with industry.

3.1 PRIORITY NEEDS AND SUGGESTED MEASURES

- Formation of syllabi/programmes as they apply specifically to the country;
- Production of teacher instructional packets;
- Resource materials available to both teachers and students;
- Teacher training;
- Resource persons to aid in teacher training;
- On-going research on the short-term and long-term effects for Grenada (or any other territory within the sub-region)
- Research on alternative methods of disposal, recycling or uses.

3.2 MEASURES

- Assuming that the problems are similar among the territories, a small regional committee could get together and formulate a proposed syllabus or programme with enough flexibility to allow specific countries to meet their own needs.
- Participants in other territories who may have resource materials can share their information among their colleagues so that there is a resource centre in every territory.

- A sub-regional workshop should be held for nominated participants from all territories. On their return, these participants must hold training workshops in their own Member States.

- A Directory of Resource persons throughout the Member States should be developed.

- Each territory through their appropriate Ministries should have documented evidence on the short term and long term environmental effects of different kinds of waste products.

4.4 SUGGESTED STRATEGIES FOR THE INCORPORATION OF ENVIRONMENTAL EDUCATION IN INDUSTRIAL EDUCATION

- The first step is to impress on the Governments of the participating countries the extent to which solid and liquid wastes affect the ecological system of their respective countries and the need therefore to fully orient the people that are directly involved in the production of these wastes.

- Formulate policies which can give clear guidelines in terms of what is expected.

- Emphasise that the best way to tackle the problem is through education.

- Teacher training and provision of equipment are vital.

- Make the public fully aware by promoting programmes on the radio, television and, the press, and other public forums.

- A network for proper evaluation of strategies must be put in place.

- The programme must be practically oriented.

In conclusion, the time has come when we can no longer afford to ignore Environmental Education. It is therefore the responsibility of concerned educators to begin promoting environmental awareness.

A.8.6 **GUYANA:** Summary by John Cummings

Environmental education enables an understanding of how the system works and through that understanding endeavours to guide that part of intervention at the level of policy and programme implementation.

It is a component of the educational process engaged in by several groups of persons in the formal education system. The relationship of man and his environment should be intimate and it must be recognised that man is part of his environment and that he is acting on or being acted upon by it; hence education about the environment goes deeper than the acquisition of facts and knowledge about it, but rather, penetrates man's state of existence, his life and habits.

Scope

This paper identifies current environmental issues within Guyana, namely:

(a) Water supply;

(b) Energy;

(c) Pollution;

(d) Sewerage;

(e) Population;

(f) Resources depletion;

(g) Erosion.

Major Environmental Problems

Guyana comprises three geographical/geoglogical regions (i) Mountainous (ii) Sandy (iii) Clay/coastal

The coastal region is below sea level, and is inhabited by the bulk of the population. Agriculture is well established in this area. This region suffers from acute water supply problems.

Water is obtained from wells and reservoirs and is boosted by pumps driven by mechanical or electrical means through galvanised or p.v.c. pipes.

The critical situation is the lack of adequate water pressure. This is created by the capacity of the system being inadequate for the demand, the seasonal low water level in the reservoir due to long dry spells and the reduction of pipe bores by blockage and accumulated rust.

The electricity supply is often unstable due to operational and other reasons and is a contributing factor responsible for the unavailability of water.

Solution

Currently, maintenance and rehabilitation processes are on stream in the water supply system. The re-introduction of water reservoirs (vats) can solve this problem.

Energy

Oil is one of the main sources of energy. It has to be imported, and entails foreign exchange, hence the limiting of consumption was attempted in order to curtail spiraling energy costs.

Wood and its by-products are readily available in Guyana and could be used to offset the oil fuel cost by the re-introduction of steam prime movers for alternators.

Biogas

This alternative means of energy has been successfully used in limited circumstances and it is serving its purpose as an alternative energy source.

Solar Energy

This has been experimented on and can be a reality. However, its high capital cost which entails foreign exchange, might be disadvantageous.

Water

Hydro-electric sources are available in Guyana. There is one hydro-electric source in operation; with possibilities for others.

Another means of natural resource for supplying electric power is wind. This is applicable in some areas for generators to supply power at lower outputs. It is also suitable for domestic emergency uses.

Population

In developing countries like Guyana, there continues to be population migration from rural to urban areas in the search for job opportunities. This creates a problem of obtaining adequate shelter and further aggravates the water situation with potential health consequences.

Pollution

Industrialisation of cities and rural areas cause polution to the environment by fumes, gas, dust, litter, oil waste and noise.

A means for limiting this interference must be established by the respective agencies and authorities.

Drainage and Irrigation

Drainage and Irrigation is a priority factor specifically within the clay belt where agriculture is predominant. The area is below the sea level, hence drainage and irrigation are priority issues.

The Mahaica - Mahaicony - Abary project has done some extensive work on very large acreages of land.

The Guyana Sugar Corporation also plays a specific role in improving drainage and irrigation on sugar cane production lands.

Sewerage

Currently, community work is in progress to rehabilitate the system.

Resources Depletion

For the renewable resources, specific implementation strategies must be introduced to maintain these resources.

Erosion

Soil erosion has been a problem but the relevant authorities are combating the problem.

Disposal of Waste

Solid waste is collected by a Central Municipal Body then incinerated; in other instances it is used as land fill for low lying areas.

Oil waste is monitored, with some amount is being recycled. It is also effective in the destruction of weeds and termites.

Current Industrial Education Programme

Students of Building, Business and Engineering departments are currently involved in components as per objectives.

Graduates of the various institutions leave not only as specialists in their respective fields, but in addition are exposed to factors relating to attitude and safety during their training.

Potable Water

This originates from artesian wells and reservoirs and the requirement for human consumption is maintained.

Water Storage

After purification it is stored for distribution. In some cases it is boiled by consumers for further purification if a contamination is suspected.

Food Preparation Programme

The Carnegie School of Home Economics has programmed in their curriculum all aspects of hygienic precautions.

Implementation

Selection of specific syllabuses and target groups, additional information and related studies coupled with practical and laboratory facilities would have to be built into educational programmes.

Problems Encountered

Difficulties are experienced in attracting young academically qualified persons to our programmes, but there have been signs of improvement since the introduction incentive schemes.

Environmental Education Dimension of Industrial Education

Health and safety are components of the programme. Participants of the Institute are the major partners in the execution of Governments policies in this area and have participated in structural programmes relating to EE at the primary and secondary levels.

The Community high schools teach actual care of the environment in day to day activities such as agriculture, sanitation and basic hygiene at the micro level.

Industrial education teachers are specialists in their particular areas and their training includes the safe use of organic and inorganic matter.

Priority Needs and Suggested Measures

The needs must be considered in a local context. The components should be broken down into elements and topics then

developed into a syllabus. Priority for their implementation must be considered.

The subject can be time-tabled as a separate unit or incorporated into the main subjects so as to establish their relationships with the main vocational subject areas.

Remedying of problems should be a community project giving the participants the satisfaction developmental gain.

Alternatively, EE can be time-tabled as a separate subject on the timetable. The methodology should be in the form of fact finding and problem solving.

The subject values should be broken down into elements and sub-topics and assembled as modules.

Suggested strategies for Incorporation of EE in Industrial Education

Since the environment is centered around health, life, welfare and people, environmental education should be reinforced in the industrial arena with the intervention of Safety and Public Health Officers to highlight the existence of short comings. Discussions, seminars and workshops, must be forthcoming and used as the educational media. All possible means of teaching aids should be used to assist assimilation.

Methods

Departmental needs coupled with the needs of the target groups should be influenced by the following methods namely:

(i) Discussions

(ii) Problem solving and fact finding

(iii) Role play

(iv) Field tours, work experience, and demonstration.

Talks and lectures should be organised and delivered by the specialists. Participants must take part in discussions in order for the evaluation process to be valid.

Agricultural activity is a national policy requirement and should be practiced by all institutions where ever possible. This entails land preparation, sowing, crop husbandry, harvesting among others. Education on fertilizers should embody special emphasis on storage, usage, health hazards precautions and usage of plant products after application.

It is a governmental policy to recycle waste products in the form of cane trash, wood waste, and padi-husk. Indeed, the time is ripe for the introduction of these technologies into the environmental education programme.

Widespread dissemination of information related to correct attitudes need to be adopted by the general population on matters of an environmental nature.

A.8.7 **JAMAICA:** Summary by Vernal Thompson

Environmental Education (EE) should occupy an integral position in the curricula of all types of schools and not just Industrial schools. The whole question of EE must be examined in the content of the country's population which is inseparably intertwined with the environment. Everyone is affected directly and indirectly by our environmental imbalances which in turn affect our physical and material well-being.

Major Environmental Problems, Their Causes and Solutions

These are classified as:

(a) Natural and Man-made Problems

(i) Soil Erosion;

(ii) Deforestation;

(iii) Pollution of sea, beach and rivers;

(iv) Pollution of Air;

(v) Reduced stream flows and lowering of water-tables;

(vi) Disposal of bauxite red-mud waste;

(vii) Flooding.

(b) Social Problems

(i) Noise pollution;

(ii) Urban overcrowding;

(iii) Population pressure on the land;

(iv) Brain drain - loss of professional expertise.

Causes

These are multiple and interrelated. The great demand for land by the rapidly growing population has resulted in the indiscriminate use of hillside, and steep lands through burning, overgrazing, over-cultivation, forest removal for fuel, subsistence farming and settlements. The sea, beaches and rivers are often polluted by discharge of industrial effluents, untreated sewage, oil spills and household and factory waste. The processing of alumina results in the accumulation of red-mud waste which may lead to the contamination of rivers and aquifers, destruction of aquatic life and pollution of the atmosphere.

The noise problem is caused by the increased number of motor vehicles, air traffic, factories and insatiable desires in some areas for loud music. The concentration of development, services and population pressure on the land have led to urban overcrowding.

SOLUTION

Efforts to solve these problems are fragmentary as there is no centralized body to deal with these issues. Environmental management in Jamaica is dependent on the effort of several agencies. Public Sector and Non-Governmental Agencies concerned mainly with environmental control and management are:

(a) Public Sector
(b) The National Resources Conservation Division
(c) The Office of Disaster Preparedness (ODP)
(d) The Forestry Department
(e) The Environmental Control Division
(f) The Energy Division, (Ministry of Mining & Tourism)
(g) The Town Planning Department
(h) The Urban Development Corporation (Statutory Body).

Non-Governmental Organisations presently carrying out EE are:

(a) The Jamaica Geographical Society
(b) The Natural History Society of Jamaica
(c) The Association of Science Teachers of Jamaica
(d) and The Jamaica Society of Scientists and Technologists.

Recently, the ODP launched an intensive flood disaster awareness programme involving private sector, professional groups, development planners and government officials. There is also their Flood Plain Mapping Project. In the area of soil conservation the Hope River Water-shed Management was launched in early 1988 with the aim of helping to correct environmental degradation in several rural areas in the parish of St. Andrew. The Urban Development Corporation through Metropolitan Parks and Markets is engaged in efforts of beautification and city cleaning, while the Forest Industries Development Corporation is engaged in a re-afforestation programme.

Current Industrial Education Programme

Industrial Education institutions at the secondary level comprise Technical High Schools, Comprehensive High Schools, Vocational Institutes, the Human Employment and Resource Training (HEART) Academies, Trade Training Centres, New Secondary Schools and Second Cycle at some Traditional High Schools. At the Tertiary level are the Vocational Training Development Institute (VTDI), College of Arts, Science & Technology (CAST) and the College of Agriculture (COA).

Most of the curricula for specialised courses in Industrial schools do not readily lend themselves to EE infusion. A few of the general subjects such as Geography, Biology, Social Studies and History naturally lend themselves to EE. They arise mainly to fulfill syllabus requirements for CXC and GCE examinations. The objectives for the CXC Vocational Proficiency Examination published for the 1988 examinations do not reflect EE interest.

In the curricula for the tertiary institutions specific objectives for EE are minimal and incidental, except for those institutions which incorporate several EE related topics into specific subject syllabi.

Priority Needs and Suggested Strategies

There is no clear governmental policy commitment to environmental protection, neither is there any national policy on EE for Industrial schools. Priority needs require:

(i) Establishment of a Ministry of Environmental Protection and Awareness;

(ii) Comprehensive Environmental Legislation together with the necessary enforcement regulations;

(iii) Additional courses with EE components in the curricula of tertiary institutions;

(iv) Inclusion of EE subjects in the curricula of Local Examination Bodies and the Caribbean Examinations Council (CXC) examination;

(v) Funding to be given major consideration;

(vi) Environmental protection should be an aim of CARICOM, funded by the respectiveCaribbean Territories in conjunction with UNESCO and UNEP.

Strategies should include:

(i) Pre-training and inservice training of teachers;

(ii) Use of infused models in curricula;

(iii) Development of modules to aid teachers and students;

(iv) Teaching strategies should include field trips, workshops, seminars, role playing, projects, and experiments;

(v) Strong co-operation between environment protection agencies and technical education institutions;

(vi) Mass media, helping to mobilize the nation;

(vii) Strategies to include Objectives, Assessment, Evaluation and Funding.

EE in Competition

Currently there are two educational innovations in Jamaican Secondary schools:

(i) the Computer Based Education and

(ii) the Entrepreneurship Education

These two programmes are receiving strong support from the business community and the Government because of their strong appeal regarding job opportunities. The fact that EE does not, visibly and directly have a job appeal makes it more difficult to get a foot hold in the schools and society at large.

A.8.8 **ST. LUCIA:** Summary by Giles Romulus

BACKGROUND INFORMATION

To contextualise environmental problems, a knowledge of physiography and socio-economic conditions is of paramount importance.

St. Lucia is an island in the Insular Caribbean with an area of 616 km^2 or 61,643 hectares. Here, because of topography, coastal settlements is the norm. In addition, land resources are scarce and less than 10% of the Island has slopes of 5^0 or less, with only 2.6% of the land classified as Grade 1.

The economy is essentially monocultural with Bananas and Tourism being the main foreign exchange earners. A slump in any of these industries will precipitate Balance of Payments problems. The mean population growth rate exceeds 2.5% per annum and the annual natural increase is well over 3000 per year. Within this context "..... the most burning issue of development is the careful husbandry of scarce natural resources ...." (Williams, 1986).

ENVIRONMENTAL PROBLEMS

The environmental problems vary from acute deforestation (2% p.a.) and its repercussions, to pollution and waste management; coastal zone mis-management; indiscriminate agro-chemical usage; destructive land practices; and the concomitant problems of urban congestion and land capture. Studies have shown that some ecosystems may be approaching their carrying capacity.

Actions taken to combat these problems include the simultaneous enforcement of Environmental Legislation by Government Departments, along with informal EE. programmes, inter alia.

A committed Minister and his Ministry with the audacity to enforce Environmental Legislation and educate the public can initiate desired changes. The enforcement of the **Litter Act No. 24, 1983 as amended No. 15, 1985** by the Ministry of Health is an example worth noting. Litter Wardens with powers of arrest have been trained while the Ministry has placed litter bins in the city and used the media to educate the public. This has quickly brought about a much improved environment in the capital. Government agencies must take the initiative if environmental problems are not to become uncontrollable.

ENVIRONMENTAL EDUCATION

St. Lucia's first Community College came into operation for the first time in 1987. The Sir Arthur Lewis Community College (SALCC) is an amalgamation of the St. Lucia 'A' Level College, the Technical College, and the Teachers' College.

This is the only college where Teacher Training and Industrial Education is carried out within one institution. It is here that there is greatest scope for the incorporation of EE. into the curriculum, using a multi-disciplinary approach and drawing skills from various Divisions and expertise from Government Departments, Statutory Bodies and Non-Governmental Organisations (NGO's).

There is no formal structure for EE. in St. Lucia, only a few Government Departments and NGO's have unilaterally assured responsibility for all the EE. in the island. The Ministry of Education has no known policy for the Incorporation of Environmental Education (EE.) into schools.

Agencies and syllabuses which include or undertake aspects of EE include:

1. The St. Lucia School of Agriculture;
2. The Department of Forestry;
3. The Department of Fisheries;
4. The Ministry of Health;
5. The St. Lucia National Trust;
6. The National Research Development Foundation (NRDF)
7. The St. Lucia Naturalists' Society;
8. The Plus Belle Village Committee;
9. C.C.A/E.C.N.A.M.P. (Caribbean Conservation Association/Eastern Caribbean Natural Areas Management Programme); and
10. O.E.C.S/N.R.M.P/G.T.Z (Organization of Eastern Caribbean States/Natural Resource Management Programme/German Technical Overseas Division).
11. Primary School syllabus in Social Studies and Secondary School Syllabuses in Geography, , Biology, Chemistry, Agricultural Science and Social Studies.

All these agencies are either directly involved in EE. or at least have shown an interest and have funded EE programmes.

Other conclusions include a lack of Government Policy in EE; the presence of ad hoc EE. Programmes; and the need to fully integrate SALCC to facilitate the establishment of cross-departmental, cross-divisional and multi-disciplinary courses. Despite this picture, pioneering agencies in EE. like the Department of Forestry, have provided exemplary service in the process of national sensitization through EE.

PRIORITY NEEDS

Such needs are numerous, and include the close collaboration between International and Regional Organisations (e.g. UNESCO and CCA) to encourage Ministries of Education to develop national policies on EE. Seminars through the OECS Secretariat and/or CARICOM Secretariat can be organised to sensitize Ministers of Education, Permanent Secretaries and Chief Education Officers of the urgency for EE. They too, need to develop environmental consciousness.

The aforementioned organisations should through the Ministry of Education, organise seminars and workshops for teachers. Seminars and workshops will help to sensitize teachers and provide an avenue for consultation in the development of an action plan for the incorporation of EE. into the Education System at all levels. Imposition of foreign syllabuses without a participatory approach is a recipe for failure of any EE. Programme.

Other priority needs include the training of teachers at all levels in EE; thorough collaboration between UWI's Faculty of Education, CERMES* and other regional agencies like CAST**, in the development of flexible syllabuses; the movement from an Exclusive Territory Principle to a Principle of Greater Cooperation and Integrated Decision-Making within and among Government Departments; the dire need for a Regional Network for Information Sharing (e.g. CERMES in the Eastern Caribbean and UWI and/or **CAST in the Northern Caribbean); the need for setting up of Regional Mechanisms and channels for cooperation in EE. e.g. the establishment of a Caribbean Association of Environmental Educators (C.A.E.E.) - an NGO for the articulation of environmental issues and a catalyst in the field of EE; the greater concientization of the public by NGO's like CCA and the St. Lucia Naturalists' Society, which will help to create a healthy atmosphere for national debate and action on environmental problems and loosen the decision-making process; and the need for external funding and technical assistance in establishing EE. curricula.

STRATEGIES FOR THE INCORPORATION OF EE. AT SALCC

Two alternative strategies are suggested. The first is a strategy of consultation for maximum concientization of teachers of EE. and for the infusion of EE. in a formal and emphatic manner in various subject syllabuses. Workshops for teachers and liasion with examination bodies like CXC is very important (this will require a regional approach). A Government policy decision through its Ministry of Education is crucial if a successful and formal structure is to be put in place.

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* Centre for Resource Management and Environmental Studies

** College of Arts, Science and Technology

Alternative two is the establishment of a Department or Division of Environmental Studies and Resource Management in the medium to long run at SALCC (5 to 10 years). Alternative two could be a gradual progression from alternative one if there is need. The need however will only come after decision-makers are convinced of the benefits and a minimum cost but effective and workable strategy is developed through consultation among teachers. Here there is a role for International, Regional and National bodies to help convince decision-makers.

Such a plan is systematic and requires meticulous planning, as well as dialogue at all levels in the Education System. Teachers must be made to feel a part of the planning and implementation process, given the high opportunity cost of scarce resources and the competition for those resources among other subjects. From Primary through Secondary Schools to Technical and Vocational Schools a programme of EE. which dovetails should be the ultimate objective.

CONCLUSION

Attitudes must be changed through knowledge and awareness, and people must become more eco-sensitive by developing environmental ethics through EE. at all levels in society. Ultimately, without a change from an 'Eco-destructive Attitude' to a 'Sustainable Utilization Attitudes' through EE., small island economies are likely to become perfect examples of environmental dystopias.

A.8.9 **ST. VINCENT AND THE GRENADINES:** Summary by Kent Dennie

Introduction

Over the last few years, the Ministry of Agriculture and the Ministry of Health along with various social clubs and organizations have achieved much success in arousing public awareness with regard to some of the activities of Vincentians which are destructive to the environment. Quite recently the Forestry Division has been very instrumental in starting an organization known as the St. Vincent and the Grenadines Environmental Society, the main purpose of which is to educate Vincentians about their environment so that they can learn how to take better care of it. The department has also been instrumental in getting the Government to pass an Act in 1987 in the House of Assembly to help to protect certain wild-life existing in the mountains.

Industrialization is one of the main contributing factors to most of the environmental problems faced in St. Vincent and the Grenadines. Hence, it is essential that all industrial workers become familiar with the relevant knowledge, skill and attitudes so necessary in bringing about positive changes in their perception of the environment.

Major Environmental Problems

1. Littering
2 Soil and Beach erosion
3. Deforestation
4. River and Air Polution

The causes of these problems seem to be attributed to attitude and lack of education relating to the environment.

Current Industrial Education Programme

In St. Vincent and the Grenadines, an insight into industry is given through an Industrial Arts program to students of sixteen (16) primary schools and sixteen (16) secondary schools. At this level students are provided with basic knowledge and skills in Woodwork and Technical Drawing. Students from the primary and secondary schools around the Kingstown area attend the Technical Centre and are instructed in Metal work- which includes welding, machine shop practice, bench-metal work, Woodwork and Technical Drawing.

The institutions which can be considered as dealing with a program of Industrial Education are the Technical College, two multipurpose centres which form a part of the Organization of

Eastern Caribbean States (O.E.C.S) Technical/Vocational program in St. Vincent and the Grenadines and the Skills Training Unit of the Ministry of Labour which train people for specific jobs in the job-market. The Skills Training project is sponsored by the World Bank.

At the Kingstown Technical Centre, an Adult-evening class program is conducted in Building, Drawing, Joinery and Welding for students who have left school and are desirous of developing their skills further for gainful employment.

Environmental Education Dimensions of Industrial Education

The extent to which Environmental Education can be incorporated into Industrial Education depends on a number of factors.

If Environmental Education is to be incorporated into Industrial Education, instructors would have to be trained to deal with the subjects in an interdisciplinary manner. To do this, instructors, education officers and the Government would have to be convinced of the need.

There is also the question of developing the relevant curriculum/programme. This area also requires some training on the part of instructors and officials of the Ministry of Education. It seems evident that a program of this nature would depend to a great extent on the duration of the courses offered in the Industrial Education Programme.

Environmental Education certainly has a place in Industrial Education and should be taught in an interdisciplinary manner so as to help students to develop a sense of appreciation for their environment.

Priority needs:

- Teacher Training in Environmental Education (to assist in curriculum development and to act as resource persons);
- Teacher Training in Industrial Education with an interdisciplinary approach;
- Drawing-up a programme with specific objectives to meet this need;
- Production of text-books and other materials with these objectives in mind.

Strategies for incorporation E.E. in I.E. Programmmes

- Officials of the Ministry of Education should collaborate with training institutions with regards to how this can be done;
- Convincing the Government of the importance of this type of program;
- Organizing workshops with teachers of Industrial subjects;
- Organizing Public-Awareness programmes.

Conclusively, let us make Environmental Education available to our Industrial Education students through our programme so as to enable them to make a positive contribution in helping to save our environment.